SYBSC|2024-28 (2)

Exam. Seat No : [ ]

Total No. of Questions: 3 Total No. of Pages: 1

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
(Autonomous)
Affiliated to Savitribai Phule Pune University, Pune
S.Y.B.Sc.
MICROBIOLOGY
SEMESTER III
MIB-201-MJM : BACTERIAL SYSTEMATICS
(NEP Pattern)

Time: One Hour. **(No. of Credits 02)** **Max. Marks: 30**

Instructions to the candidate:

- *All questions are compulsory.*
- *Draw neat and labelled diagram whenever necessary.*

Q.1 (A) Attempt each of the following: **(1 Mark each)**

1. Define –Taxonomy.
2. Define –Neotype.
3. State True or False : Prokaryotes are classified based on 16s rRNA sequence.
4. Fill in the blank : Two organisms with 95% DNA homology can say to be.....
   A. Similar B. Closely related C. Distantly related D. None of these.

(B) Attempt each of the following: **(2 Marks each)**

1. Define – Holotype.
2. What is taxonomy?
3. Write a formula for %G+C content.

Q.2 Attempt <u>any four</u> of the following : **(3 Marks each)**

1. Explain artificial classification system.
2. Explain Whittaker's five kingdom classification.
3. Write a short note on - Cytochrome composition.
4. Describe the different steps involved in numerical taxonomy.
5. Describe Hackel's three kingdom classification system.
6. Write note on Bergey's manual of systematic bacteriology.

Q. 3 Attempt <u>any two</u> of the following : **(4 Marks each)**

1. Explain chemotaxonomy based on isoprenoid quinones.
2. Differentiate three domains as per Carl Woese's classification.
3. Describe DNA hybridization with diagram.
4. Explain binomial nomenclature in detail.

Exam. Seat No : [ ]

Total No. of Questions: 3

Total No. of Pages: 1

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
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Affiliated to Savitribai Phule Pune University, Pune
S.Y.B.Sc.
MICROBIOLOGY
SEMESTER III
MIB-202-MJM Soil Microbiology
(NEP Pattern)

Time: OneHour. **(No. of Credits 02)** **Max. Marks: 30**

Instructions to the candidate:

- *All questions are compulsory.*
- *Draw neat and labelled diagram whenever necessary.*

Q.1 (A) Attempt **each** of the following (1 Marks each)

(i) Define Soil Microbiology.
(ii) Give the examples of lignin degrading bacteria.
(iii) Define Symbiosis.
(iv) Give the examples of sulphate reducing bacteria.

(B) Attempt **each** of the following (2 Marks each)

(i) Give the role of humus in soil.
(ii) Give the function of soil microflora.
(iii) What is rhizoplane?

Q.2 Attempt **any four** of the following (3 Marks each)

(i) Describe in detail soil profile.
(ii) Describe the soil microbial communities.
(iii) Write down the steps involved in carbon cycle.
(iv) Write a note on biogeochemical cycles.
(v) Discuss about soil aeration & its mechanism.
(vi) Give the role of bacteria in nitrification process.

Q.3 Attempt **any two** of the following (4 Marks each)

(i) Describe in detail steps involved in N_2 cycle.
(ii) Explain the role of microorganisms in degradation of pectin.
(iii) Discuss the positive interaction within microbial population.
(iv) Differentiate predation from parasitism.

Total No. of Questions: 3

Exam. Seat No: [ ]

Total No. of Pages: 1

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
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S.Y.B.Sc.
MICROBIOLOGY
SEMESTER III
MIB-203-MJM: AIR MICROBIOLOGY
(NEP Pattern)
(No. of Credits 02)

Time: One Hour. **Max. Marks: 30**

Instructions to the candidate:

- *All questions are compulsory.*
- *Draw neat and labelled diagram whenever necessary.*

Q.1 (A) Attempt <u>each</u> of the following **(1 Mark each)**

1. Define droplet nuclei.
2. Enlist two factors affecting microbial survival in air.
3. Write the use of electrostatic precipitation.
4. Enlist any two physical methods of air sanitation.

(B) Attempt <u>each</u> of the following **(2 Marks each)**

1. Enlist methods of air sampling.
2. Write any four names of airborne pathogens.
3. What are aerosols?

Q.2 Attempt <u>any four</u> of the following **(3 Marks each)**

1. Explain transient nature of air flora.
2. Write a note on emerging trends in air microbiology.
3. Explain sedimentation method.
4. Write in detail about Lemon air sampler.
5. Explain any two air borne infections.
6. Write a note on air pollution.

Q.3 Attempt <u>any two</u> of the following **(4 Marks each)**

1. Describe the control and prevention of air borne infections.
2. Describe any four chemical pollutants, sources in air and effects on human health.
3. Explain the air sampling using Anderson's air sampler.
4. Explain air sanitation by chemical method.

Exam. Seat No. [ ]

Total No. of Questions :3 **Total No. of Pages : 1**

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
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Class:SYBSc
Subject:Microbiology
Semester -III
Course Code : MIB-211-MN
Course Title: Basic Microbiology
(NEP Pattern)

Time:1 Hour **(No. of Credits 02)** **Max. Marks:30**

Instructions to the candidates: (If any)
i. All questions all compulsory
ii. Draw a neat labeled diagram whenever necessary

Q1. (A) Attempt <u>each</u> of the following (1 Marks each)
(i) What is decoloriser.
(ii) Define: Disinfection.
(iii) Relief staining is also called as_____.
(iv) What is the function of condenser in microscope?

(B) Attempt <u>each</u> of the following (2 Marks each)
(i) What is magnification?
(ii) Enlist the type of eyepiece of microscope.
(iii) Give two examples of acidic stains.

Q2. Attempt any <u>four</u> of the following (3 Marks each)
(i) Write a short note on ideal characters of the disinfectant.
(ii) Write a note on types of objective lenses.
(iii) Explain the construction of compound microscope.
(iv) Explain spherical aberration in lenses.
(v) Write the principle of capsule staining.
(vi) Write the procedure of negative staining.

Q3. Attempt any <u>two</u> of the following (4 Marks each)
(i) Explain the working of bright field microscopy.
(ii) Write the role of UV radiation in sterilization.
(iii) Write a note on phenol coefficient method.
(iv) Explain the mode of action of halogen compounds as disinfectant.

Total No. of Questions: 3

Exam. Seat

Total No. of Pages: 1

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
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Affiliated to Savitribai Phule Pune University, Pune
S.Y.B.Sc.
MICROBIOLOGY
SEMESTER III
MIB-221-VSC : DAIRY MICROBIOLOGY
(NEP Pattern)

Time: One Hour. **(No. of Credits 02)** **Max. Marks: 30**

Instructions to the candidate:

- *All questions are compulsory.*
- *Draw neat and labeled diagram whenever necessary.*

Q.1(A) Attempt <u>each</u> of the following **(1 Mark each)**

1. Define - Milk.
2. Define – Skimmed milk.
3. State True or False: The fat content of buffalo milk is 6-12%.
4. Name the causative agent of ropiness in milk.

(B) Attempt <u>each</u> of the following **(2 Marks each)**

1. What is double toned milk?
2. What is clean milk?
3. What is colostrum?

Q.2 Attempt <u>any four</u> of the following **(3 Marks each)**

1. Write a principle of MBRT test.
2. Explain adulteration test for water content in milk.
3. Describe any three physicochemical properties of milk.
4. Explain mastitis test.
5. Write a note on milk microflora.
6. Describe the preparation of Paneer.

Q.3 Attempt <u>any two</u> of the following **(4 Marks each)**

1. Write a note on the composition of milk.
2. Describe preparation of cheese making.
3. Explain factors affecting quality and quantity of milk.
4. Describe the test to check efficiency of pasteurization.

[Total No. of Question: 3] Seat No

Anekant Education Society's [Total No. of Pages- 1]

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati

(Empowered Autonomous)

Affiliated to SavitribaiPhule, Pune University

Class- S..Y. B.A.,B.COM.,B.Sc.,B.Sc.(CS) , B.B.A. (CA), B.Voc.

MARATHI (मराठी) (Semester-IV)

Sub Code – MAR- 281-AEC- लेखन निर्मिती व परीक्षण कौशल्ये

(NEP 2023 Pattern)

Time : 1. Hours **(No. of Credits 2)** **Max Marks : 30**

सूचना- १) सर्व प्रश्न सोडविणे आवश्यक आहे.
२) उजवीकडील अंक प्रश्नांचे पूर्ण गुण दर्शवितात.

प्र.१ला. खालील प्रश्न सोडवा. (४)

अ) खालील प्रश्नांची उत्तरे एका वाक्यात लिहा.

१. निबंधाची व्याख्या लिहा.
२. 'नटसम्राट', हे नाटक कोणी लिहिले?
३. ग्रंथपरीक्षणाची व्याख्या लिहा.
४. वर्णनात्मक निबंधाचा कोणताही एक विषय सांगा ?

ब) खालील प्रश्नांची उत्तरे २० शब्दांत लिहा. (६)

१. तुम्हांला माहित असलेल्या कोणत्याही दोन नाटकाची नावे लिहा .
२. मराठी नाटकाचे जनक कोणास म्हटले जाते ?
३. ग्रंथपरीक्षणाची कोणतेही दोन माध्यमे लिहा .

प्र.२ रा. खालील प्रश्नांची उत्तरे ५० शब्दांत लिहा. (कोणतेही चार) (१२)

१. समीक्षणात्मक लेखन म्हणजे काय? स्पष्ट करा.
२. निबंधाची संकल्पना स्पष्ट करा.
३. नाटकाची संहिता कशास म्हटले जाते?
४. ग्रंथपरीक्षकाचे गुण लिहा .
५. नाटकाचे स्वरूप थोडक्यात स्पष्ट करा .
६. प्रायोगिक नाटकाविषयी माहिती लिहा.

प्र.३रा. खालील प्रश्नांची उत्तरे १५० शब्दांत लिहा. (कोणतेही दोन) (८)

१. 'ग्रंथपरीक्षण एक कला आहे .' याविषयी चर्चा करा.
२. तुम्ही वाचलेल्या कोणत्याही एका ग्रंथाचे ग्रंथपरीक्षण लिहा.
3. पुढीलपैकी कोणत्याही एका विषयावर निबंध लिहा.
१. ग्रंथ हेच गुरु २ . मी महाविद्यालयाचा प्राचार्य झालो तर...?
४. तुम्ही वाचलेल्या कोणत्याही एका नाटकाचे परीक्षण लिहा.

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Anekant Education Society's

Tuljaram Chaturchand College, Baramati,(Arts, Commerce & Science)

(Autonomous)

Seat No. :

Total No. of Questions : 03 Total No. of Pages : 02

(S.Y.B.A./B.Com./B.Sc./B.C.A./B.C.S./B.B.A.)

(SEM -IV)

Subject Code & Name: [HIN-281-AEC] हिंदी भाषा : संप्रेषण कौशल

[NEP-2020] (2023 Pattern)

समय : 1 घंटा **No.of Credits 02** अंक :30

सूचनाएँ: 1) एक सभी प्रश्न अनिवार्य हैं।

2) दाहिनी ओर लिखे अंक प्रश्न के पूर्णांक हैं।

प्रश्न-1 अ) निम्नलिखित <u>बहुविकल्पीय प्रश्नों</u> के उत्तर लिखिए। (04)

1) 'श्रवण' शब्द संस्कृत के ..... धातु से बना है ।

1) श्राव्य 2) श्रु 3) श्रवण 4) सृजन

2) अपने भावों एवं विचारों को स्पष्टतापूर्वक भाषा द्वारा अभिव्यक्त करना ही ..... कौशल है।

1) वाचन कौशल 2) लेखन कौशल 3) श्रवण कौशल 4) भाषण कौशल

3) श्रवण और भाषण यह ..... के रूप हैं।

1) संप्रेषण कौशल 2) सृजन कौशल 3) वाचन कौशल 4) लेखन कौशल

4) श्रवण में ..... महत्वपूर्ण है।.

1) ध्यानपूर्वक सुनना 2) विषय ज्ञान 3) उच्चारण 4) इनमें से सभी

आ) निम्नलिखित प्रश्नों के <u>संक्षेप</u> में उत्तर लिखिए। (06)

1) भाषिक कौशल के प्रकार कौन - कौन से हैं?

2) श्रवण कौशल का अर्थ स्पष्ट करते हुए उसकी कोई भी एक परिभाषा लिखिए।

3) संप्रेषण कौशल से क्या तात्पर्य है?

(P.T.O.)

प्रश्न-2) निम्नलिखित प्रश्नों में से <u>किन्ही चार प्रश्नों</u> के 50-60 शब्दों में उत्तर लिखिए। (12)

1) श्रवण कौशल का महत्व लिखिए।
2) भाषण कौशल का स्वरुप स्पष्ट कीजिए।
3) श्रवण कौशल के उद्देश्य को स्पष्ट कीजिए।
4) भाषण कौशल की विशेषताएं स्पष्ट कीजिए।
5) श्रवण में बाधाएँ उत्पन्न करनेवाले घटक कौन से हैं?
6) भाषण कौशल में कौन - कौन सी बातें महत्वपूर्ण हैं?

प्रश्न-3) निम्नलिखित प्रश्नों में से <u>किन्ही दो प्रश्नों</u> के 80-120 शब्दों में उत्तर लिखिए। (08)

1) श्रवण कौशल की विशेषताएं स्पष्ट कीजिए।
2) भाषण कौशल में सुधार कैसे करें?
3) श्रवण कौशल के गुण बताइए।
4) व्यक्तिमत्व विकास में भाषिक कौशलों का महत्व स्पष्ट कीजिए।

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Exam. Seat No : [ ]

Total No. of Questions: 03 Total No. of pages: 01

Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati

(Autonomous)

Affiliated to Savitribai Phule Pune University, Pune

S.Y.B.Sc. Microbiology

SEMESTER IV

MIB-251-MJM : BACTERIAL PHYSIOLOGY

(2023 NEP pattern)

(No. of Credits 02)

Time: One Hour **Max. Marks: 30**

Instructions to the candidate:

- ***All questions are compulsory.***
- ***All questions carry equal marks.***
- ***Draw neat and labelled diagram whenever necessary.***

Q.1 (A) attempt each of the following : **(1 Mark each)**

i. Define – Metabolism.
ii. Define – Respiration
iii. State True or False : Anabolism is the reaction of synthesis.
iv. Fill in the blank – The enzymes produced in the cells and function outside the cell are called as.....
A. Endoenzymes B. Exoenzymes C. Constitutive enzymes D. None of the above.

(B) Attempt each of the following : **(2 Marks each)**

i. What is autotrophy?
ii. What is coenzyme?
iii. What is prosthetic group?

Q.2 Attempt any four of the following : **(3 Marks each)**

i. Write a short note on - Ribozyme
ii. Represent schematically - Homofermentative pathway.
iii. Write any six properties of enzyme.
iv. Explain Lock and key model of catalysis.
v. Describe oxidative phosphorylation.
vi. Draw neat and labelled diagram of electron transport chain.

Q.3 Attempt any two of the following : **(4 Marks each)**

i. Represent schematically - EMP pathway.
ii. Write a note on high energy molecule with ATP as example.
iii. Draw Tricarboxylic acid cycle in detail.
iv. Write a note on classification system of enzyme.

Exam. Seat No:

Total No. of Questions: 03 Total No. of pages: 01

Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati

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S.Y.B.Sc. Microbiology

SEMESTER IV

MIB-252-MJM: Introduction to Industrial Microbiology

(2023 NEP pattern)

(No. of Credits 02)

Time: One Hour **Max. Marks: 30**

Instructions to the candidate:

- *All questions are compulsory.*
- *All questions carry equal marks.*
- *Draw neat and labelled diagram whenever necessary.*

Q.1 (A) attempt each of the following: **(1 Mark each)**

i. Define – Inoculum in fermentation
ii. Define – Master culture.
iii. Name any one pH indicator dye used in screening of organic acid producer.
iv. What is the function of baffle?

(B) Attempt each of the following: **(2 Marks each)**

i. Enlist any two materials used in construction of fermenter.
ii. Write any two names of minor ingredient used in fermentation media.
iii. Write any two names of organic acid.

Q.2 Attempt any four of the following: **(3 Marks each)**

i. Write the short note on secondary screening.
ii. Explain the different types of Impeller.
iii. Explain the dual fermentation.
iv. Describe the temperature sensors.
v. Explain Auxonography.
vi. Write the role of sparger.

Q.3 Attempt any two of the following: **(4 Marks each)**

i. Write down the consequences of contamination.
ii. Describe the role of antifoaming agents with any one example of antifoaming agent.
iii. Write a short note on crowded plate technique.
iv. Describe the types of pH sensor.

Exam. Seat No :

Total No. of Questions: 03 Total No. of pages: 01

Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati

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Affiliated to Savitribai Phule Pune University, Pune

S.Y.B.Sc. Microbiology

SEMESTER IV

MIB-253-MJM: WATER MICROBIOLOGY

(2023 NEP pattern)

(No. of Credits 02)

Time: One Hour **Max. Marks: 30**

Instructions to the candidate:

- ***All questions are compulsory.***
- ***All questions carry equal marks.***
- ***Draw neat and labelled diagram whenever necessary.***

Q.1 (A) Attempt each of the following: **(1 Mark each)**

i. Define- Activated Sludge.
ii. Enlist the contaminants found in surface water.
iii. State whether the following statement is true or false: High Chemical Oxygen Demand (COD) in water indicates low organic pollution.
iv. The Pore size of membrane filter is .....

(B) Attempt each of the following: **(2 Marks each)**

i. Write the importance of MPN test.
ii. Define Potable water and its importance.
iii. Write any two roles of Bureau of Indian Standards (BIS).

Q.2 Attempt any four of the following: **(3 Marks each)**

i. What is eutrophication? How does it affect aquatic life.
ii. Write a note on Primary effluent treatment.
iii. Describe confirmed test using EMB agar for detection of coliforms.
iv. Write the disease symptoms caused by *Vibrio cholerae*.
v. Write a note on recycling of waste water.
vi. Describe the trickling filter.

Q.3 Attempt any two of the following: **(4 Marks each)**

i. Explain any two Chemical methods used for water purification.
ii. Write short note on Biomagnification.
iii. Explain the role of *E.coli* as an indicator of fecal contamination in water.
iv. What is Biological oxygen demand (BOD) and write the formula to calculate BOD.

Exam. Seat No :

Total No. of Questions:03 Total No. of pages: 01

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
(Autonomous)
Affiliated to Savitribai Phule Pune University, Pune
S.Y.B.Sc. Microbiology
SEMESTER IV
MIB-261-MN : Essentials of Microbiology
(2023 NEP pattern)
(No. of Credits 02)

Time: One Hour **Max. Marks: 30**

Instructions to the candidate:

- *All questions are compulsory.*
- *All questions carry equal marks.*
- *Draw neat and labelled diagram whenever necessary.*

Q.1 (A) Attempt each of the following : **(1 Mark each)**

i. _____ ml of sample is used in pour plate technique.
ii. Give two examples of Photoautotrophs.
iii. State True or False- Halophiles grows well at 5% NaCl Concentration.
iv. Name any two macro elements having role in bacterial growth.

(B) Attempt each of the following : **(2 Marks each)**

i. What is Synchronous growth?
ii. Define- Acidophiles.
iii. Define- Chemoautotrophs.

Q.2 Attempt any four of the following : **(3 Marks each)**

i. Write a short note on Enriched medium.
ii. Write a short note on Turbidometric method.
iii. Give the role of Agar & NaCl in the media.
iv. Write down principle of Neubauer's Chamber along with well labelled diagram.
v. Write down classification of bacteria based on their optimum temperature.
vi. With the help of graph explain Diauxic growth.

Q.3 Attempt any two of the following : **(4 Marks each)**

i. Draw bacterial growth curve & elaborate on Logarithmic phase of bacterial growth.
ii. Write down characteristics of Halophiles.
iii. Write down principle of Freezing method of preservation.
iv. Describe synthetic medium in detail.

Exam. Seat No : [ ]

Total No. of Questions: 5 Total No. of Pages: 1

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
(Autonomous)
Affiliated to Savitribai Phule Pune University, Pune
S.Y.B.Sc.
MICROBIOLOGY
SEMESTER IV
USMB241 : BACTERIAL GENETICS
(2022 Pattern)

Time: Two Hour. **(No. of Credits 03)** **Max. Marks: 60**

Instructions to the candidate:

- *All questions are compulsory.*
- *Draw neat and labelled diagram whenever necessary.*

Q.1 (A) Attempt each of the following: **(1 Mark each)**

1. Define : Gene
2. Enlist the stop codons
3. Define : Spontaneous mutation
4. Write names of any two chemical mutagens.

(B) Attempt each of the following: **(2 Mark each)**

1. Draw structure of guanine
2. Draw structure of thymine.
3. Define: Genetic code
4. What is transition mutation?

Q.2 Attempt ANY THREE of the following : **(4 Marks each)**

1. Write a note on - Messelson & Stahl Experiment
2. Describe Elongation in translation.
3. Draw diagram of B form DNA
4. Draw diagram of Rolling circle model

Q. 3 Attempt ANY TWO of the following : **(6 Marks each)**

1. Write a short note on -Avery MacLeod experiment.
2. Describe Prokaryotic genome organization
3. Explain induced mutation.

Q.4 Attempt ANY TWO of the following : **(6 Marks each)**

1. Explain missense & nonsense mutation.
2. Describe mutation by intercalating agent.
3. Write the properties of genetic code.

Q.5 Attempt ANY ONE of the following : **(12 Marks each)**

1. Explain the basic mechanism of transcription
2. Write the Griffith's experiment in detail.

Exam. Seat No : [ ]

Total No. of Questions: 05 Total No. of pages: 01

Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati

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Affiliated to Savitribai Phule Pune University, Pune

S.Y.B.Sc. Microbiology

SEMESTER IV

USMB242 AIR AND WATER MICROBIOLOGY

(2022 Pattern)

(No. of Credits 03)

Time: Two Hours **Max. Marks: 60**

Instructions to the candidate:

- *All questions are compulsory.*
- *All questions carry equal marks.*
- *Draw neat and labelled diagram whenever necessary.*

Q.1 (A) Attempt each of the following: **(1 Mark each)**

i. Define – Droplet nuclei
ii. Define – Air pollution
iii. What is WHO?
iv. Write examples of any two water borne infections.

(B) Attempt each of the following: **(2 Mark each)**

i. What is aerosol?
ii. What is biomagnification?
iii. Define – Total solid.
iv. Define - Eutrophication

Q.2 Attempt ANY THREE of the following : **(4 Marks each)**

i. Write a short note on- *Clostridium perfringens*
ii. Write characteristics of faecal pollution indictor.
iii. Explain transient nature of air flora.
iv. Explain in short – Ozonization.

Q. 3 Attempt ANY TWO of the following : **(6 Marks each)**

i. Write a short note on – Air sanitation.
ii. Write a note on *Camylobacter* as indicator of faecal pollution.
iii. Explain in detail – Membrane filter technique.

Q.4 Attempt ANY TWO of the following : **(6 Marks each)**

i. Describe UV radiation method for water purification.
ii. Explain in detail- Presumptive coliform test.
iii. Explain the process for recycling of wastewater.

Q.5 Attempt ANY ONE of the following : **(12 Marks each)**

i. Explain biological oxygen demand and chemical oxygen demand in detail.
ii. What is air sampling? Explain air sampling by impaction on solids method.

Total No. of Questions: 05

Exam Seat No. [ ]

Total No. of pages: 01

Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati

(Autonomous)

Affiliated to Savitribai Phule Pune University, Pune

S.Y.B.Sc. Microbiology

SEMESTER IV

MICRO2401: BACTERIAL GENETICS

(2019 pattern)

(No. of Credits 03)

Time: Two Hours **Max. Marks: 60**

Instructions to the candidate:

- *All questions are compulsory.*
- *All questions carry equal marks.*
- *Draw neat and labelled diagram whenever necessary.*

Q.1 (A) Attempt <u>each</u> of the following: **(1 Marks each)**

i. Define - Genetic code.
ii. Give any two names of chemical mutagens.
iii. Enlist the stop codons.
iv. Define - Spontaneous mutation.

(B) Attempt <u>each</u> of the following: **(2 Marks each)**

i. Draw structure of Guanine.
ii. Draw structure of Thymine.
iii. Define - Plasmid.
iv. Define - Central dogma.

Q.2 Attempt <u>ANY THREE</u> of the following : **(4 Marks each)**

i. Draw diagram - Replication fork.
ii. Draw diagram - B form DNA.
iii. Draw diagram - Rolling circle model.
iv. Write a short note on initiation of transcription.

Q. 3 Attempt <u>ANY TWO</u> of the following : **(6 Marks each)**

i. Explain Avery MacLeod experiment.
ii. Write a note on transition & transversion mutation?
iii. Write a note on Prokaryotic genome organization.

Q.4 Attempt <u>ANY TWO</u> of the following : **(6 Marks each)**

i. Explain missense & nonsense mutation.
ii. Describe mutation by intercalating agent.
iii. Write the properties of genetic code.

Q.5 Attempt <u>ANY ONE</u> of the following : **(12 Marks each)**

i. Write the Griffiths experiment in detail.
ii. Explain the basic mechanism of translation.

(2)

Seat No. [ ]

Total No. of Questions: 3 Total no. of Pages: 1

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
(Empowered Autonomous)
S. Y. B. Sc. BOTANY
(Semester -III)
BOT-202-MJM: Plant physiology-I
(NEP Pattern)

Time: One Hour **(No. of Credits 02)** **Max. Marks: 30**

Instructions to the candidates:
i. All questions are compulsory.
ii. Figures to right indicate full marks.
iii. Draw neat labeled diagrams wherever necessary.

Q.1 (A) Attempt <u>each</u> of the following. **(1 Marks each)**

i. Define Plant Physiology.
ii. What are Aquaporins?
iii. Define De-plasmolysis.
iv. Mention any two theories of Ascent of sap.

(B) Attempt <u>each</u> of the following. **(2 Marks each)**

i. Give importance of Diffusion in Plants.
ii. Define Anti-transpirants and Guttation.
iii. Give applications of Vernalization.

Q.2 Attempt <u>any four</u> of the following. **(3 Marks each)**

i. Describe scope of Plant Physiology.
ii. Define Plasmolysis. Describe mechanism of Plasmolysis.
iii. Describe types of Seed Dormancy.
iv. Write note on 'Arc Auxanometer'.
v. Define Photoperiodism. Add a note on Short Day Plants.
vi. Give an account on factors affecting Plant growth.

Q.3 Attempt <u>any two</u> of the following. **(4 Marks each)**

i. What is Osmosis. Describe types of solutions.
ii. Define 'Ascent of Sap'. Add a note on Transpiration Pull Theory.
iii. Define Seed Dormancy. Describe factors causing Seed Dormancy.
iv. Describe mechanism of opening and closing of Stomata with reference to Steward's hypothesis.

Seat No. [ ]

Total No. of Questions: 3

Total No. of Pages: 1

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
(Empowered Autonomous)

S. Y. B. Sc. BOTANY
(Semester - IV)
BOT-251-MJM, Plant Anatomy
(NEP 1.0 / 2023 Pattern)

Time: 1.00 Hour **(No. of Credits - 02)** **Max. Marks: 30**

Instructions to the candidates:

i. All questions are compulsory.
ii. Figures to right indicate full marks.
iii. Draw a neat labelled diagram wherever necessary.

Q.1 (A) Attempt <u>each</u> of the following. **(1 Mark each)**

i) Define Plant Anatomy.
ii) Define vascular bundle.
iii) Define living cell.
iv) Define parenchyma cell.

(B) Attempt <u>each</u> of the following. **(2 Marks each)**

i) Comment on scope of plant anatomy.
ii) Comment on annual rings.
iii) Give the functions of mechanical tissue system of plants.

Q. 2 Attempt any <u>four</u> of the following. **(3 Marks each)**

i) Give the need of normal secondary growth.
ii) Write short note on tylosis.
iii) Give the functions of meristematic tissue.
iv) Discuss the secondary growth in vascular region.
v) Comment on any one reason of anomalous secondary growth.
vi) Write short note on trichomes.

Q.3 Attempt any <u>two</u> of the following. **(4 Marks each)**

i) Sketch, label and describe the typical dicot stomata.
ii) Comment on the principles - inflexibility and incompressibility of mechanical tissues.
iii) Sketch, label and describe structure of xylem tissue.
iv) Sketch, label and describe T. S. of *Bignonia* stem.

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Seat No. [ ]

Total No. of Questions: 3 **Total no. of Pages: 1**

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
(Empowered Autonomous)

Affiliated to Savitribai Phule Pune University, Pune

S. Y. B. Sc. BOTANY
(Semester - IV)
BOT-252-MJM Plant Embryology
(NEP 1.0 / 2023 pattern)

Time: One Hour **No. of Credits 02** **Max. Marks: 30**

Instructions to the candidates:

i. All questions are compulsory.
ii. Figures to right indicate full marks.
iii. Draw neat labeled diagrams wherever necessary.

Q.1 (A) Attempt each of the following: **(1 Marks each)**

i) Give definition of Plant Embryology.
ii) What is the meaning of PMC?
iii) Define plant embryo.
iv) Give definition of pollination.

(B) Attempt each of the following: **(2 Marks each)**

i) What is double fertilization and triple fusion?
ii) Write any two importance of Plant Embryology.
iii) Define megaspore and megasporogenesis.

Q. 2 Attempt any <u>four</u> of the following: **(3 Marks each)**

i) Describe structure of tetrasporangiate anther.
ii) Define microspore tetrads? Write types of microspore tetrads.
iii) Explain structure of orthotropous ovule.
iv) What is endosperm? Write types of endosperm.
v) Explain scope of Plant Embryology in Plant Taxonomy.
vi) Explain structure of mature pollen grain.

Q.3 Attempt any <u>two</u> of the following: **(4 Marks each)**

i) Give an illustrated account of the development of male gametophyte.
ii) What is seed? Explain types of seed with example.
iii) What is embryogenesis? Describe the development of dicotyledonous embryo.
iv) What is embryo sac? Explain the types of embryo sac with example.

Seat No. [ ]

Total No. of Questions: 3 Total no. of Pages: 1

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
(Empowered Autonomous)

S. Y. B. Sc. BOTANY
(Semester - IV)
BOT-253-MJM Plant Ecology
(NEP 1.0 / 2023 pattern)

Time: 1.00 Hour **Number of Credits (02)** **(Max. Marks: 30)**

Instructions to the candidates:
i. All questions are compulsory.
ii. Figures to right indicate full marks.
iii. Draw neat labeled diagrams wherever necessary.

Q.1 (A) Attempt each of the following: **(1 Mark each)**

i) Define the term plant ecology.
ii) What is bioaccumulation?
iii) Write long form of EIA.
iv) What is food chain?

(B) Attempt each of the following: **(2 Marks each)**

i) What are the biotic components of ecosystem?
ii) Define autecology and synecology.
iii) What is Environmental Audit?

Q. 2 Attempt any <u>four</u> of the following: **(3 Marks each)**

i) Write ecological pyramid of Energy.
ii) Explain bio-geochemical cycle of carbon.
iii) Define ecosystem and explain aquatic ecosystem.
iv) Write note on Ozone depletion.
v) Write external adaptive features xerophytes.
vi) Explain secondary succession.

Q.3 Attempt any <u>two</u> of the following: **(4 Marks each)**

i) Describe applications of plant ecology.
ii) Define population and explain its characteristics.
iii) What is EIA? Explain methodology of EIA.
iv) What is succession? Explain Hydrosere succession.

Seat No. [ ]

Total No. of Questions: 3 Total no. of Pages: 1

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
(Empowered Autonomous)

S. Y. B. Sc. BOTANY
(Semester - IV)
BOT-261-MN Horticulture
(NEP 1.0 / 2023 pattern)

Time: 1.00 Hour **Number of Credits (02)** **Max. Marks: 30**

Instructions to the candidates:
i. All questions are compulsory.
ii. Figures to right indicate full marks.
iii. Draw a neat labeled diagrams wherever necessary.

Q.1 (A) Attempt each of the following: **(1 Marks each)**

i) Define Horticulture.
ii) Enlist the any two types of vegetative plant propagation in plant?
iii) What is integrated pest management?
iv) Write the principle of horticulture.

(B) Attempt each of the following: **(2 Marks each)**

i) What is Indoor gardening?
ii) What is Training in Orchard.
iii) What is Grafting?

Q. 2 Attempt any <u>four</u> of the following: **(3 Marks each)**

i) Explain the concept and scope of Indoor gardening.
ii) Write Cultivation of Mango.
iii) Explain pruning in Orchard.
iv) Explain the climatic requirements for horticultural plants.
v) Explain the natural modifications of stem in plants.
vi) What are the recent trends in horticulture?

Q.3 Attempt any <u>two</u> of the following: **(4 Marks each)**

i) Discuss the detail process of layering in plant propagation.
ii) Explain in brief management of Nursery.
iii) Write the classification of fruit plants based on fruit type.
iv) Explain commercial cultivation of rose flowers.

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Seat No. [ ]

Total No. of Questions : 5 Total no. of Pages : 1

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
(Autonomous)

S. Y. B. Sc. BOTANY
(Semester – IV)
USBT 241 : Anatomy and Embryology
(2022 Pattern)

Time : 2.00 Hours) **(No. of Credits 03)** **(Max. Marks : 60**

Instructions to the candidates :

i. All questions are compulsory
ii. Figures to right indicate full marks
iii. Draw neat labelled diagrams wherever necessary

Q.1 Attempt the following : **(12)**

i) Define tissue. (1)
ii) What is trichome? (1)
iii) Define Embryology. (1)
iv) What is seed? (1)
v) Enlist the types of vascular bundles. (2)
vi) Mention any two functions of mechanical tissue system. (2)
vii) Give the definition of megasporogenesis. (2)
viii) Enlist the types of ovules. (2)

Q.2 Answer any three questions of the following : **(12)**

i) Explain importance of anatomy in taxonomy.
ii) What is epidermal tissue system? Give the types of epidermal tissues.
iii) Draw neat and well labelled diagram of male gametophyte.
iv) What is endosperm? Mention any one type of endosperm.

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Q.3 Attempt any two questions of the following : **(12)**

i) What is cambium? Discuss its role in secondary growth.
ii) Define stomata? Describe the types of stomata found in plants.
iii) Sketch, label and describe the typical embryo sac.

Q.4 Answer any two questions of the following : **(12)**

i) Explain any two principle involved in distribution of mechanical tissues.
ii) Describe structure and function of xylem.
iii) Write a note on entry of pollen tube into the embryo sac.

Q.5 Answer any one question of the following : **(12)**

i) Sketch, label and describe normal secondary growth in *Annona* stem.
ii) Give an illustrated account of the development of female gametophyte of angiosperms.

Exam. Seat No.

Total No. of Questions: 5 Total No. of Pages: 1

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce,
Baramati (Autonomous)
Affiliated to Savitribai Phule Pune University, Pune

Class. S.Y. B.Sc. **Subject Botany**
Semester IV **Paper Code: USBT 242 Plant Ecology**

(2022 Pattern)

Time: 02 Hours **Max. Marks: 60**

Instructions to the candidates

1) *All questions are compulsory*
2) *Figures to the right indicate full marks.*
3) *Draw neat labelled diagrams wherever necessary*

Q 1 A) Attempt <u>each</u> of the following **(1 Mark each)**

i Define autecology.
ii What is food chain?
iii What is bioaccumulation?
iv What is succession?

B) Attempt <u>each</u> of the following **(2 Marks each)**

v Give any two applications of plant ecology.
vi What is ecotone?
vii Define vivipary?
vii What is remote sensing?

Q 2 Attempt <u>any three</u> of the following **(4 Marks each)**

i Describe phosphorus cycle.
ii Write a note on prevention and control of air pollution.
iii Define environmental audit and mention its objectives.
iv Write a note on concept of remote sensing.

Q 3 Attempt <u>any two</u> of the following **(6 Marks each)**

i Define population, describe its concept of population in detail.
ii Write a note on Xerosere.
iii Explain the causes and effects of ozone depletion.

Q 4 Attempt <u>any two</u> of the following **(6 Marks each)**

i Write a note on external and internal adaptive features of Xerophytes.
ii What is primary and secondary succession.
iii What is EIA? Describe the methodology of EIA.

Q 5 Attempt <u>any one</u> of the following **(12 Marks each)**

i What are ecological pyramids? enlist its types and explain the structure of pyramid of energy with suitable example.
ii Define *in-situ* conservation and describe it's the method of conservation with suitable example.

Seat No. [ ]

Total No. of Questions: 5 Total no. of Pages: 1

Anekant Education of Society's

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati

(Empowered Autonomous)

S. Y. B. Sc. [BOTANY]

BOT-2402: Plant Ecology

(2019 Pattern) (Semester-IV)

Time: 2.00 Hours Max. Marks: 60

Instruction to the candidates:

- All questions are compulsory.
- Each question carries equal marks.
- Draw a neat, clean and labelled diagram wherever necessary.

Q.1) All questions are <u>compulsory</u>. **12 Marks**

i. Define Plant ecology (1)
ii. Define the term Population (1)
iii. What is meant by Xerophyte? (1)
iv. Write long Form of EIA (1)
v. What is the difference between the concept of community and population? (2)
vi. Define the term climax community. (2)
vii. Define remote sensing and give its basic principles. (2)
viii. What is environmental audit? Write its needs. (2)

Q.2) Answer any <u>Three</u> questions **12 Marks**

i. Explain biogeochemical cycle of carbon (4)
ii. Write a note on ecological pyramid of number (4)
iii. Write a note on primary and secondary succession. (4)
iv. Write note on Global positioning system (4)

Q.3) Answer any <u>Two</u> questions **12 Marks**

i. Explain causes, prevention and control of water pollution. (6)
ii. Write a note on Ozone depletion. (6)
iii. Explain aquatic and terrestrial ecosystem. (6)

Q.4) Answer any <u>Two</u> questions **12 Marks**

i. Explain ecological adaptations in xerophytes. (6)
ii. Explain in brief Eutrophication, bioaccumulation and biomagnifications. (6)
iii. Explain the process of data acquisition in remote sensing. (6)

Q.5) Answer any <u>One</u> question **12 Marks**

i. Define the term population and explain in detail characteristics of population. (12)
ii. Define ecological succession and give an account of the stages of hydrosere. (12)

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(2)

Exam Seat No. [ ]

Total No. of Questions: 03 Total No. of Pages: 01

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
(Autonomous)
Affiliated to Savitribai Phule Pune University, Pune
S. Y. B. Sc.
Zoology
Semester-IV
ZOO-251-MJM: Animal Systematics & Diversity -IV
(2023 NEP Pattern)

Time: One Hour **(No. of Credits: 02)** **Max. Marks: 30**

Instructions to the candidates:

i. All questions are compulsory
ii. Draw neat labelled diagram wherever necessary
iii. All questions carry equal marks.

Q.1. (A) Attempt **each** of the following. (1 Mark each)

(i) Give any two examples of flightless birds.
(ii) What is the function of gizzard in birds?
(iii) Give any two examples of aquatic mammals.
(iv) Define bird migration.

(B) Attempt **each** of the following. (2 Marks each)

(i) Enlist the types of scales found in reptiles.
(ii) Give any two characters of subclass Diapsida.
(iii) Give any two characters placental mammals.

Q.2 Attempt **any four** of the following. (3 Marks each)

(i) Give the general characteristies of class Mammalia and give two examples.
(ii) How do mammals regulate their body temperature?
(iii) Explain the role of feathers in birds.
(iv) Give the characteristics of poisonous snakes.
(v) Write a short note on flaying mammals.
(vi) What is the syrinx in birds? Mention its function.

Q.3 Attempt **any two** of the following. (4 Marks each)

(i) Give the general characteristics of class Reptilia and give any two examples.
(ii) Explain the respiratory system of *Labeo rohita* in brief.
(iii) Describe the habit and habitat of *Labeo rohita.*
(iv) Describe the nervous system of *Labeo rohita*?

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Exam Seat No. [ ]

Total No. of Questions: 03] [Total No. of Pages: 01

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science & Commerce, Baramati
(Autonomous)
Affiliated to Savitribai Phule Pune University, Pune
S.Y.B.Sc. (Zoology) Semester-IV
ZOO-252-MJM: Applied Zoology - II
(NEP- 2023 Pattern)
(No. of Credits-02)

Time: One Hour] *[Max. Marks: 30*

Instructions to the candidates:

4) ***All questions are compulsory.***
5) ***Neat labelled diagrams must be drawn wherever necessary.***
6) ***Figures to the right indicate full marks.***

Q.1. A) Attempt each of the following: **[01 Mark each]**

i) What is bee bread?
ii) What is Sericulture?
iii) What is nuptial flight?
iv) What is brushing?

B) Attempt each of the following: **[02 Marks each]**

i) Give the function of bee veil
ii) Enlist types of silk moths
iii) Give any two uses of honey

Q.2. Attempt <u>any four</u> of the following: **[03 Marks each]**

i) Explain Nosema disease of honey bee
ii) Explain Usi fly as pest of silkworm
iii) Write short note on honey extractor
iv) What is mulberry harvesting? Explain its methods
v) Explain round dance of honey bee
vi) Explain external characters of *Bombyx mori*

Q.3. Attempt <u>any two</u> of the following: **[04 Marks each]**

i) Explain queen of honey bee.
ii) Explain pebrinee disease of *Bombyx mori*
iii) Explain uses of wax
iv) Explain silkworm-rearing methods

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Exam. Seat No. [ ]

Total No. of Questions: 03 Total No. of Pages: 01

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
(Autonomous)
Affiliated to Savitribai Phule Pune University, Pune
S.Y. B. Sc
Zoology
Semester-IV
ZOO-253-MJM: Environmental Biology
(2023 NEP Pattern)

Time: One Hour **No. of Credits: 02** **Max. Marks: 30**

Instructions to the candidates:

i. *All questions are compulsory*
ii. *Draw neat labelled diagram wherever necessary*
iii. *All questions carry equal marks.*

(1 Marks each)

Q.1 (A) Attempt <u>each</u> of the following.

(i) Define environment
(ii) What are pollutant?
(iii) What is non-renewable resources?
(iv) What is Wildlife conservation?

(2 Marks each)

(B) Attempt <u>each</u> of the following.

(i) Define ecosystem & enlist its types.
(ii) What are degradable pollutants? Give one example.
(iii) What is population? Give one example.

(3 Marks each)

Q.2 Write short notes on <u>any four</u> of the following.

(i) Write a short note on land pollution.
(ii) Explain in brief causes of air pollution.
(iii) Write a short note on effects of water pollution.
(iv) Write a short note on forest conservation.
(v) Write a short note on importance of wildlife management.
(vi) Explain the concept of carbon credit.

(4 Marks each)

Q.3 Attempt <u>any two</u> of the following.

(i) Explain the components of an ecosystem.
(ii) Explain greenhouse effect.
(iii) Explain plants and animals as bioindicator.
(iv) Explain ex-situ mode of conservation.

****YOY****

[Total No. of Pages: 01

Total No. of Questions: 03]

Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science & Commerce, Baramati

(Autonomous)

Affiliated to Savitribai Phule Pune University, Pune

S.Y.B.Sc. (Zoology) Semester-IV

ZOO-261-MN: Dairy Science

(NEP- 2023 Pattern)

(No. of Credits-02)

Time: One Hour] *[Max. Marks: 30*

Instructions to the candidates:

1) All questions are compulsory.

2) Neat labelled diagrams must be drawn wherever necessary.

3) Figures to the right indicate full marks.

[01 Mark each]

Q.1. A) Attempt each of the following:

i) What is filtration of milk?

ii) What is breeding?

iii) What is A1 milk?

iv) Give any two milk products?

[02 Marks each]

B) Attempt each of the following:

i) Dehorning in cattles

ii) Crossbreeding

iii) Castration in cattles

[03 Marks each]

Q.2. Attempt <u>any four</u> of the following:

i) Explain inbreeding

ii) Explain freezing of milk

iii) Write short note on Malvi breed

iv) Explain whole milk

v) Explain Murrah buffalo breed

vi) Explain Dermatophytosis disease of cattles

[04 Marks each]

Q.3. Attempt <u>any two</u> of the following:

i) Explain clarification of milk

ii) Explain composition of milk

iii) Explain Holstein breed

iv) Write short note on milk products

XOX

Exam. Seat No. [ ]

Total No. of Questions: 5 Total No. of Pages: 1

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
(Empowered Autonomous)
Affiliated to Savitribai Phule Pune University, Pune
SYBSc
Zoology Semester-IV
ZOO 2401: Animal Systematics & Diversity-IV
(Backlog) (2019 [illegible] Pattern)

Time: 02.00 Hours **Max. Marks: 60**

Instructions to the candidates: (If any)

i. All questions are compulsory
ii. Figures to the right side of each question indicate full marks.
iii. Draw neat labelled diagram wherever necessary.

Q. 1 A) Attempt each of the following. **(01 Mark each)**

i) What is migration?
ii) What is Anapsid skull?
iii) Give any two aerial / volant adaptations in birds.
iv) What is blubber?

Q. 1 B) Attempt each of the following. **(02 Marks each)**

i) What is macula & crista?
ii) What is metanephric kidney?
iii) What is opisthoglyphy?
iv) Enlist the Weberian ossicles in *Labeo*.

Q. 2 Attempt <u>any three</u> of the following. **(04 Marks each)**

i) Enlist any 08 adaptations of aquatic mammals.
ii) Give typical characters of egg-laying mammals.
iii) Sketch & label the structure of typical feather.
iv) Distinguish between Reptilia & Aves.

Q. 3 Attempt <u>any two</u> of the following. **(06 Marks each)**

i) Explain mechanism of respiration in *Labeo*.
ii) Write a note on venom of snake.
iii) Describe desert adaptations of reptiles.

Q. 4 **Attempt <u>any two</u> of the following.** **(06 Marks each)**

i) Enlist all cranial nerves of *Labeo* with number and nature.
ii) Write a note on venom delivery system of venomous snake.
iii) Birds are described as 'flying machines'. Justify your answer.

Q. 5 **Attempt <u>any one</u> of the following.** **(12 Marks each)**

i) Describe female reproductive system of any bony fish.
ii) Justify the development of new structures and loss of some structures in aquatic mammals.

Exam. Seat No. [ ]

Total No. of Questions: 05 Total No. of Pages: 01

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
(Empowered Autonomous)
Affiliated to Savitribai Phule Pune University, Pune
SYBSc
Zoology Semester-IV
USZL 241: Animal Systematics & Diversity-IV
(Backlog) (2022 Pattern)

Time: 02.00 Hours **Max. Marks: 60**

Instructions to the candidates: (If any)

i. All questions are compulsory
ii. Figures to the right side of each question indicate full marks.
iii. Draw neat labelled diagram wherever necessary.

Q. 1 A) Attempt each of the following. **(01 Mark each)**

i) What is pterylae?
ii) What is placenta?
iii) What is mesonephric kidney?
iv) What is blubber?

Q. 1 B) Attempt each of the following. **(02 Marks each)**

i) Give the names of flight muscles.
ii) What is latitudinal migration?
iii) What is venous heart?
iv) Enlist any two sense organs of *Labeo*.

Q. 2 Attempt <u>any three</u> of the following. **(04 Marks each)**

i) Compare distinguishing characters of Reptilia & Mammalia.
ii) Give typical characters of aquatic mammals.
iii) Sketch & label: brain of *Labeo*.
iv) Write a note on digestive glands of *Labeo*.

Q. 3 Attempt <u>any two</u> of the following. **(06 Marks each)**

i) Explain mechanism of sound production in birds.
ii) Write a note on feather colour.
iii) Describe desert adaptations of reptiles.

Q. 4 **Attempt <u>any two</u> of the following.** **(06 Marks each)**

i) Describe the types of migration in birds.
ii) Which structures are lost in aquatic mammals? Justify loss of any two structures.
iii) Give reptilian & avian characters of egg-laying mammals.

Q. 5 **Attempt <u>any one</u> of the following.** **(12 Marks each)**

i) Describe respiratory system of any bony fish.
ii) Describe structure of a typical feather & explain location & function of various types of feathers.

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SEAT NO. [ ]

Total No. Of Questions: 05 Total No. of Pages: 01

Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science & Commerce, Baramati

(Autonomous)

Affiliated to Savitribai Phule Pune University, Pune

S.Y.B.Sc. (Zoology) Semester-IV

USZL-242 Applied Zoology- II

(2022 Pattern) (Paper- II)

[Time: 2.00 Hours] *[Max. Marks: 60]*

Instructions to the candidates:

1) All questions are compulsory.

2) Neat labelled diagrams must be drawn wherever necessary.

3) Figures to the right indicate full marks.

Q.1. A) Attempt each of the following **(1 Mark each)**

i) What is apiculture?

ii) What is sericulture?

iii) What is absconding?

iv) What is moriculture?

B) Attempt each of the following **(2 Marks each)**

i) What is round dance?

ii) Enlist types of silk moths

iii) Give any two uses of honey

iv) Give any two uses of silk

Q.2. Attempt any three of the following **(4 Marks each)**

i) Explain American foul brood disease

ii) Explain Usi fly

iii) Describe honey extractor

iv) Explain mulberry harvesting and its methods

Q.3. Attempt any two of the following **(6 Marks each)**

i) Explain worker of honey bee.

ii) Explain uses of wax

iii) Explain pebrine disease of *Bombyx mori*

Q.4. Attempt any two of the following **(6 Marks each)**

i) Explain external characters of *Bombyx mori*

ii) Explain post harvest processing of cocoons

iii) Explain wag tail dance of honey bee

Q.5. Answer any one question **(12 Marks each)**

i) Discuss on "Sericulture as agro-industry"

ii) Discuss on "Bee keeping equipments"

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(2)

Exam Seat No. [ ]

Total No. of Questions: 3 Total No. of Pages: 1

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science & Commerce, Baramati.
(Autonomous)
S.Y.B.Sc.
Environmental Science
ENV-211-MN:Man and Environment
(NEP Pattern) (Semester-III)

(Time: One Hour) **(No. of Credits 02)** **(Max. Marks: 30)**

Instructions to the candidates:

i. All questions are compulsory.
ii. Figures to right indicate full marks.
iii. Neat labelled diagrams must be drawn wherever necessary.

Q. 1. (A)Attempt EACH of the following: **(1 Marks each)**

i. Enlist current environmental issues.
ii. Define green building.
iii. Define environmental science.
iv. Write importance of natural resources.

(B) Attempt EACH of the following: **(2 Marks each)**

i. Define GIS.
ii. Write importance of environment.
iii. Enlist and explain types of GIS data.

Q. 2. Attempt ANY FOUR of the following: **(3 Marks each)**

i. Define natural resources and explain its types.
ii. Write advantages of remote sensing.
iii. Write a note on human interaction with environment.
iv. Write a brief note on biotic and abiotic factors.
v. Write a note on green technologies.
vi. Explain components of GIS.

Q. 3. Attempt ANY TWO of the following: **(4 Marks each)**

i. Write strategies for environmental conservation and protection.
ii. Write a note on applications of remote sensing.
iii. Write advantages and disadvantages of GIS.
iv. Explain components of the environment.

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Exam Seat No.

Total No. of Questions: 3 Total No. of Pages: 1

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
(Autonomous)
Affiliated to Savitribai Phule Pune University, Pune
Class: S.Y. B.Sc.
Environmental Science
Semester: IV
ENV-252-MJM: Environmental Pollution - II
(2023NEP Pattern)

Time: One Hours **(No. of Credits 02)** **Max. Marks: 30**

Instructions to the Candidates:

I. All questions are compulsory.
II. Figures to the right indicate full marks.
III. Draw neat diagrams wherever necessary.

Q1. (A) Attempt <u>each</u> of the following **(1 Mark each)**

i) What are secondary air pollutants?
ii) Define mixing height in air pollution dispersion.
iii) What is meant by L10 in noise measurement?
iv) Give two examples of air pollution control methods.

(B) Attempt <u>each</u> of the following **(2 Marks each)**

i) Explain the impact of air pollutants on vegetation.
ii) What is sound insulation in noise control?
iii) Describe the working of a gravity settling chamber.

Q2. Attempt <u>any four</u> of the following **(3 Marks each)**

i) Explain the sources and types of air pollutants.
ii) What are the effects of air pollution on materials and buildings?
iii) Describe the impact of noise pollution on human health.
iv) Explain the measurement techniques for noise pollution.
v) What is vibration damping and how does it help in noise control?
vi) Describe the importance of air sampling in pollution monitoring.

Q3. Attempt <u>any two</u> of the following **(4 Marks each)**

i) Explain the process and application of adsorption in air pollution control.
ii) Discuss various control techniques used for noise pollution.
iii) Explain the concept of Gaussian plume model with a diagram.

Exam Seat No. [ ]

Total No. of Questions: 3 Total No. of Pages: 1

Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science & Commerce, Baramati.

(Autonomous)

S.Y.B.Sc.

Environmental Science

ENV-253-MJM: Biodiversity and Its Conservation

(2023 NEP Pattern) (Semester-IV) (Paper-3)

(Time: One Hour) (No. of Credits 02) (Max. Marks: 30)

Instructions to the candidates:

i. All questions are compulsory.
ii. Figures to right indicate full marks.
iii. Neat labelled diagrams must be drawn wherever necessary.

Q. 1. (A) Attempt <u>EACH</u> of the following: **(1 Marks each)**

i. Enlist traditional methods of biodiversity conservation.
ii. Define biodiversity.
iii. Write objectives of wildlife protection act (1972).
iv. What is bioremediation?

(B) Attempt <u>EACH</u> of the following: **(2 Marks each)**

i. Explain types of bioremediation.
ii. What are the challenges to India's biodiversity?
iii. Write a note on biodiversity act.

Q. 2. Attempt <u>ANY FOUR</u> of the following: **(3 Marks each)**

i. Write a note on conservation methods of biodiversity.
ii. Write importance's of biodiversity.
iii. Explain India as a mega diverse nation.
iv. Write a note on hazardous waste impact on health.
v. Describe people's participation for biodiversity conservation.
vi. Explain advantages of using microorganisms for pollution remediation.

Q. 3. Attempt <u>ANY TWO</u> of the following: **(4 Marks each)**

i. Write a note on threats to biodiversity.
ii. Comment on levels of biodiversity.
iii. Write a note on hotspots of biodiversity.
iv. Explain ecological/ non ecological significance of biodiversity.

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Exam Seat No. [ ]

Total No. of Questions: 3 Total No. of Pages: 1

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
(Autonomous)
Affiliated to Savitribai Phule Pune University, Pune
Class: S.Y. B.Sc.
Environmental Science
Semester: IV
ENV-261-MN: Basics of Environmental Geoscience and Biology
(2023 NEP Pattern)
(No. of Credits 02)

Time: One Hours **Max. Marks: 30**

Instructions to the Candidates:

I. All questions are compulsory
II. Figures to the right indicate full marks.
III. Draw neat diagrams wherever necessary.

Q1. (A) Attempt <u>each</u> of the following **(1 Mark each)**

i) What is weathering?
ii) Define ecological adaptation.
iii) Name any two types of soil properties.
iv) What is the significance of biodiversity?

(B)Attempt <u>each</u> of the following **(2 Marks each)**

i) Explain the concept of ocean waves and tides.
ii) Describe the physical properties of sea water.
iii) What are Hydrophytes? Give an example.

Q2. Attempt <u>any four</u> of the following **(3 Marks each)**

i) Explain Plate Tectonic Theory with a diagram.
ii) What are the different types of soil weathering? Explain.
iii) Write a note on the role of forests as a bio-resource.
iv) Discuss any two evolutionary 'explosions' or mass extinctions.
v) Explain how agricultural practices affect soil health.
vi) Describe the process of sedimentary rock formation.

Q3. Attempt <u>any two</u> of the following **(4 Marks each)**

i) Explain the different adaptations in animals for survival.
ii) Discuss the significance of ocean basins in global climate regulation.
iii) Explain the threats and conservation strategies for bio-resources.
iv) Describe the different types of metamorphic rocks and their formation.

(2)

Exam. Seat No. [ ]

Total No. of Questions: 3 Total No. of Pages: 2

Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati

(Autonomous)

Affiliated to Savitribai Phule Pune University, Pune

S. Y. B. Sc.

ELECTRONICS

Semester III

ELE-201-MJM: Linear Integrated Circuits

(NEP) (2023 Pattern)

Time: One Hour (No. of Credits 02) **Max. Marks: 30**

Instructions to the candidates:

i. All questions are compulsory.
ii. Neat labelled diagrams must be drawn wherever necessary.
iii. Use of calculator and log table is allowed.
iv. Figures to the right indicate full marks.

Q1. (A) Attempt **each** of the following (1 Marks each)

(i) Draw symbol of op-amp with its terminals.

(ii)What do you mean by filter?

(iii) Define slew rate.

(iv) Write the applications of oscillator.

(B) Attempt **each** of the following (2 Marks each)

(i) Define positive and negative feedback.

(ii) What are the two requirement of oscillation?

(iii) Draw labeled diagram of Instrumentation amplifier.

Q2. Attempt any **four** of the following (3 Marks each)

(i) Write a note on all pass filter.

(ii) With neat labelled diagram explain basic building blocks of op Amp.

(iii) Calculate frequency of phase shift oscillator if R is 100kΩ, C is 10 pF.

(iv) Explain op-amp used as schmitt trigger.

(v) Draw the diagram of op amp as a differentiation circuit and derive the expression for its output voltage.

(vi) With circuit diagram explain action of op-amp as adder.

P.T.O.

Q3. Attempt any **two** of the following (4 Marks each)

(i) Draw the circuit diagram of voltage to current converter. Derive the expression for output current.

(ii) List various characteristics of op-amp. Explain any three of them.

(iii) Explain first order high pass filter with its frequency response.

(iv) With neat labelled diagram explain working of Wien bridge oscillator.

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Exam Seat No. [ ]

Total No. of Questions: 3

Total No. of pages: 01

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
(Autonomous)
Affiliated to Savitribai Phule Pune University, Pune
S.Y.B.S.c Electronics
ELE-203-MJM:Introduction to C P rogramming
Semester- III
(2024 Pattern)

Time: One Hour **(No. of Credits 02)** **Max. Marks : 30**

Instructions to the candidate:

i. All questions are compulsory.
ii. Neat labeled diagrams must be drawn whenever necessary.
iii. Use of calculator is allowed.
iv. Figures to the right indicates full marks.

Q.1.(A) Attempt **each** of the following (1 Marks each)

i) Define keywords.
ii)What is algorithms?
iii)State the library function .
iv)Write the advantages of flowchart.

(B) Attempt **each** of the following (2 Marks each)

i) Write syntax for goto statement.
ii) How 1-D arrays are declared?
iii) Define string constant .With example.

Q.2. Attempt any **four** of the following (3 Marks each)

i) Draw the Symbols of Flowchart.
ii) List integer constant? Describe any one type of integer constant
iii) Describe any two basic data in C.
iv) Write the rules for variable names.
v) Write a C Program to display first n prime number.
vi) Write a algorithm to calculate of area of triangle in C Programming

Q.3. Attempt any **two** of the following (4 Marks each)

i) Explain while loop in detail. Give one example .
ii) Write a C Program for Swapping Numbers .
iii) Explain in detail symbolic constant .
iv) List the different operators Explain arithmetic operator in details.

----------**BEST OF LUCK**----------

Exam Seat No. [ ]

Total No. of Questions: 3 **Total No. of pages: 01**

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
(Autonomous)
Affiliated to Savitribai Phule Pune University, Pune
S.Y.B.S.c Electronics
ELE-211-MN:Linear and Digital Integrated Circuit
Semester- III
(2024 Pattern)

Time: One Hour **(No. of Credits 02)** **Max. Marks : 30**

Instructions to the candidate:

i. All questions are compulsory.
ii. Neat labeled diagrams must be drawn whenever necessary.
iii. Use of calculator is allowed.
iv. Figures to the right indicates full marks.

Q.1.(A) Attempt **each** of the following (1 Marks each)
i) Define Slew rate.
ii) State Distributive law.
iii) What is Inverting amplifier?
iv) Draw block diagram for multiplexer
(B) Attempt **each** of the following (2 Marks each)
i) Give the applications of Half Adder.
ii)Draw a pin diagram of IC 7447.
iii) Difference between decoder and Demultiplexer.

Q.2. Attempt any **four** of the following (3 Marks each)
i) Explain in details Comparator.
ii) Give difference between Inverting and non inverting Amplifiers.
iii) Explain in details Priority encoder .
iv) Draw circuit diagram of Low Pass filter explain it's working.
v) State De- Morgan theorem with example.
vi) Draw circuit diagram for integrator.Explain it's working.

Q.3. Attempt any **two** of the following (4 Marks each)
i) What is Demultiplexer ? Explain working of 1:4 Demultiplexer with logic diagram.
ii) Draw the circuit diagram and explain the working of Summing amplifier.
iii) Explain in details Zero crossing detector.
iv) Explain working of Half Adder circuit with its logic diagram and truth table.

----------**BEST OF LUCK**----------

Total No. of Questions: 5

Exam Seat No.	

Total No. of pages: 1

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati.
(Autonomous)
Affiliated to Savitribai Phule Pune University, Pune.

S. Y. B. Sc.
ELECTRONICS

ELE-221-VSC: 8 bit Embedded Microcontroller and Applications
(NEP Pattern)
(No. of Credits 02)

Time: One Hour **Max Marks : 30**

Instructions to Candidates:

i. All Questions are compulsory
ii. Neat Labeled Diagrams must be drawn whenever necessary
iii. Use of calculator is allowed
iv. Figures to the right indicate full marks

Q1. (A) Attempt each of the following. **(1 Mark each)**

(i) Write the long form of SFR.
(ii) Write the data type for single bit declaration in 8051 C program.
(iii) How many ports are present in 8051 microcontroller?
(iv) What is the by default address of stack pointer register?

(B) Attempt each of the following. **(2 Marks each)**

(i) State the significance of SBUF register in serial communication.
(ii) Give the SFR address of Port 0 and Port 1.
(iii) Write RAM and ROM capacity of 8051 microcontroller.

Q2. Answer any four questions. **(3 Marks each)**

i) Explain internal RAM architecture of 8051 microcontroller with a neat diagram.
ii) Explain External RAM interfacing with a neat diagram.
iii) Write down the PSW register and explain each bit of it.
iv) Differentiate between Microprocessor and Microcontroller.
v) Define following : (1) Editor (2) Assembler (3) Compiler
vi) Write the table for size in bits and data range of following data types in 8051C.
1) unsigned char 2) signed char 3) unsigned int 4) signed int 5) sbit 6) bit

Q3. Answer any two questions. **(4 Marks each)**

(i) Write an 8051 C program to toggle the bits of P2 continuously with a 50 millisecond delay. Use timer 0, mode 1.
(ii) Write an 8051 C program to generate a square wave using port 1.
(iii) Draw the diagram for LED interfacing with 8051 microcontroller and write an 8051C program to ON-OFF that LED on port 0.
(iv) Draw the block diagram of 8051 programming model and explain each block.

Exam. Seat No. [ ]

Total No. of Questions: 3 Total No. of Pages: 2

Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati

(Autonomous)

Affiliated to Savitribai Phule Pune University, Pune

S. Y. B. Sc.

ELECTRONICS

Semester IV

ELE-251-MJM: Instrumentation Techniques

(NEP) (2023 Pattern)

Time: One Hour (No. of Credits 02) Max. Marks: 30

Instructions to the candidates:

i. All questions are compulsory.
ii. Neat labelled diagrams must be drawn wherever necessary.
iii. Use of calculator and log table is allowed.
iv. Figures to the right indicate full marks.

(1 Marks each)

Q1. (A) Attempt **each** of the following

(i) Define sensor and transducer.

(ii) What is sensitivity in measurement?

(iii) Write two applications of digital instruments.

(iv) List various dynamic characteristic of an instrument.

(2 Marks each)

(B) Attempt **each** of the following

(i) List advantages of digital instruments over analog instruments.

(ii) What is the need of instrumentation?

(iii)Write applications of DSO.

(3 Marks each)

Q2. Attempt any **four** of the following

(i) Explain various types of errors.

(ii) Describe principle of operation of digital current meter in detail.

(iii)Differentiate between analog instruments and digital instruments.

(iv)With block diagram explain Digital Multimeter.

(v) Describe the general instrumentation system with block diagram.

(vi)Explain methods of measurement.

P.T.O.

Q3. Attempt any **two** of the following (4 Marks each)

(i) Explain various static measurement characteristics in detail.

(ii) Describe fixed voltage power supply with neat labeled diagram.

(iii) Explain the block diagram, working and specifications of function generators.

(iv) With block diagram explain CRO.

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Exam Seat No. [ ]

Total No. of Pages: 1

Total No. of Questions: 3

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
(Autonomous)
Affiliated to Savitribai Phule Pune University, Pune
S. Y. B. Sc.
Electronics
Semester IV
ELE-252-MJM: Fundamentals Of Communication Systems
(NEP Pattern) 2023

Time: 01.00 Hours **(No. of Credits 02)** **Max. Marks: 30**

Instructions to the candidates:

i. All questions are compulsory.
ii. Use of calculator is allowed.
iii. Neat labeled diagrams must be drawn wherever necessary.
iv. Figures to the right show full marks.

Q1. **(A) Attempt <u>each</u> of the following** (1 Marks each)

(i) What is simplex communication?
(ii) What is Demodulation?
(iii) What do you mean by Baud rate?
(iv) Define- Signal to Noise ratio.

(B) Attempt <u>each</u> of the following (2 Marks each)

(i) Draw and briefly explain "Block diagram of Communication system".
(ii) Why modulation is needed in long way communication?
(iii) With proper diagram, write concept of "PSK, FSK."

Q2. **Attempt any <u>four</u> of the following** (3 Marks each)

(i) Explain concept of " Noise figure and Noise temperature. "
(ii) Draw and explain " AM modulator using transistor"
(iii) With proper diagrams, write concept of "PAM, PWM".
(iv) Draw and briefly explain "Electromagnetic spectrum"
(v) Write a note on "Crystal receiver ".
(vi) Explain "Concept of TDM ."

Q3. **Attempt any <u>two</u> of the following** (4 Marks each)

(i) Write a note on "Noise".
(ii) Draw and explain "Vestigial side band transmission."
(iii) Write note on " Serial and parallel communication"
(iv) Write small note on "Sensitivity & selectivity of receivers and Intermediate frequency" .

Exam Seat No. [ ]

Total No. of Questions: 3 Total No. of Pages: 01

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
(Autonomous)
Affiliated to Savitribai Phule Pune University, Pune
S.Y.B.Sc Electronics
Semester- IV

ELE-261-MN: Basics of Communication Principle

(2023 Pattern)

Time: One Hour **(No. of Credits 02)** **Max. Marks: 30**

Instructions to the candidate:

i. All questions are compulsory.
ii. Neat labeled diagrams must be drawn whenever necessary.
iii. Use of calculator is allowed.
iv. Figures to the right indicates full marks.

Q.1.(A) Attempt **each** of the following (1 Marks each)

i) What is Baud Rate?

ii) Write any one application of AM.

iii) Define Signal bandwidth.

iv) What is Date rate?

(B) Attempt **each** of the following (2 Marks each)

i) Draw input and output waveforms for FM signal.

ii) What is Noise in communication?

iii) Define modulation index and give its formula.

Q.2. Attempt any **four** of the following (3 Marks each)

i) Write a note on half duplex communication.

ii) Calculate maximum bit rate for a channel having bandwidth 3100Hz and S/N ratio is 20DB.

iii) Explain Code Division Multiple access.

iv) Differentiate between Simplex and Duplex communication.

v) Write a note on Pulse Code Modulation.

vi) What is synchronous data communication? Give its advantages and disadvantages.

Q.3. Attempt any **two** of the following (4 Marks each)

i) Explain TDM technique with neat block diagram.

ii) Describe working of amplitude modulator using Diode.

iii) With neat labeled block diagram explain communication system.

iv) Explain AM with respect to frequency spectrum.

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(2)

Seat No. :

Total No. of Pages: 2

[Total No. of Questions: 03]

Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati

(Empowered Autonomous Status)

Affiliated to Savitribai Phule Pune University, Pune

S.Y.B.Sc. Physics

Semester-III

PHY-202-MJM: Analog electronics

(NEP 1.0: 2023 PATTERN)

Time: 1.00 hours **No. of Credits-02** **Max. Marks: 30**

Instructions to Candidates:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Neat diagrams must be drawn wherever necessary.
4. Use of calculator is allowed.

Q 1: (A) Attempt each of the following. **(1 Mark each)**

a) Define the term CMRR. [1]

b) State Norton's theorem. [1]

c) Draw pin diagram of OPAMP. [1]

d) Define quiescent point (Q-point). [1]

Q 1: (B) Attempt each of the following. **(2 Mark each)**

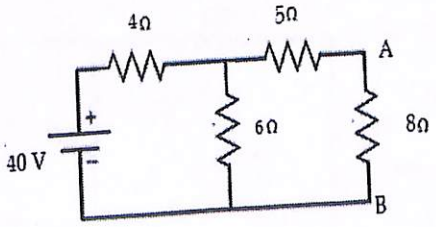
a) State the relation between α and β of transistor. [2]

b) Calculate the gain of inverting amplifier when input resistance at inverting input terminal is 10 kΩ and feedback resistance is 100 kΩ. [2]

c) State maximum power transfer theorem. [2]

Q 2: Attempt any FOUR of the following.

a) Nortonize the following circuit and calculate current across 8Ω resistor. [3]

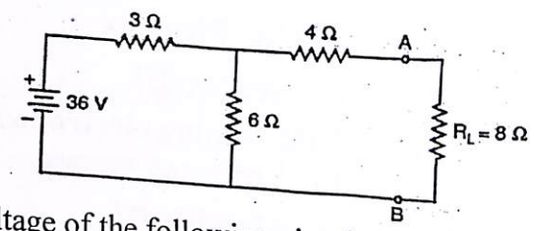


P.T.O.

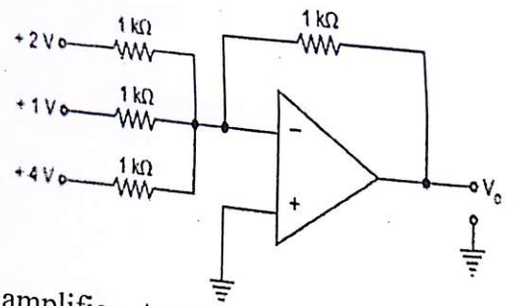
b) A sine wave of 0.5V is applied to an inverting amplifier using Ri=2kΩ and Rf=20 kΩ. Find the output voltage. [3]

c) A change of 250 mV in base-emitter voltage causes a change of 125 μA in the base current. Find the resistance of the transistor. [3]

d) Using Thevenin's theorem, calculate the current flowing through load resistor of the following circuit. [3]



e) Find the output voltage of the following circuit. [3]



f) In a positive feedback amplifier, A=100, β=0.02 and Vi=20mV. Find gain with feedback and output voltage with feedback. [3]

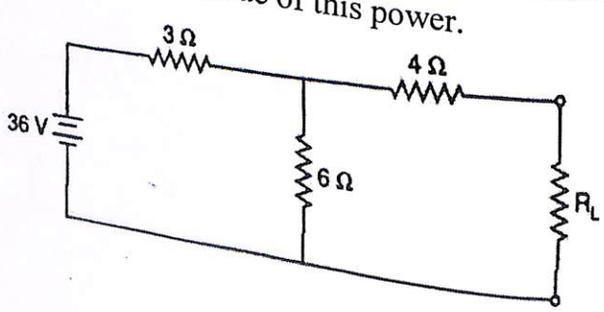
Q 3: Attempt any <u>TWO</u> of the following.

a) Draw the input and output characteristics of *CB* connection. Indicate cut-offs, saturation and active regions. What do you infer from these characteristics? [4]

b) Explain OPAMP as inverting amplifier and derive the equation for output voltage. [4]

c) Define β. Show that $\beta = \alpha/1-\alpha$ [4]

d) In the following circuit, find the value of load resistance R_L to be connected across terminals A and B which would abstract maximum power from the circuit. Also find the value of this power. [4]



Seat No. [ ]
Total No. of Pages: 02
Total No. of Questions: 03

Anekant Education Society's
TULJARAM CHATURCHAND COLLEGE OF ARTS, SCIENCE AND COMMERCE, BARAMATI
(Autonomous Status)
Affiliated to Savitribai Phule Pune University, Pune
S.Y.B.Sc. PHYSICS
Semester-III
PHYSICS Paper-III : PHY-203-MJM:Basic Optics
(NEP 2023 Pattern)

Time: 1:00 Hours] [Max. Marks: 30

Instructions to the candidates:
i) All questions are compulsory
ii) Draw neat labelled diagrams wherever necessary
iii) Figures to the right indicate full marks
iv) Use of calculator is allowed

Q1. Answer the following.

A) Select correct alternative and rewrite the sentence. (4)

i) Image of white object formed by lens is coloured & blurred, this defect is called_____
a) Chromatic aberration b) Monochromatic aberration c) Spherical aberration d) None of these

ii) Condition for minimum spherical aberration, value of x =
a) $(f_1 + f_2)/2$ b) $(f_1 - f_2)/2$ c) $(f_1 + f_2)$ d) $(f_1 - f_2)$

iii) Unit of power of thin lens is_____
a) meter b) cm c) dioptre d) watts

iv) Deviation produced by thin lens is given by δ=_____.
a) h/f b) f/h c) v/u d) u/v

B) All questions are compulsory. (6)

i) Define aberration and give its type.
ii) What are the types of convex lens?
iii) Define optical power of lens with SI unit.

Q2. Attempt ANY FOUR. **(12)**

1) Define term deviation by thin lens and linear magnification of thin lens.
2) Differentiate converging and diverging lenses.
3) Calculate the focal length of a plano-convex lens for which the radius of curvature of curved surface is 25 cm & refractive index of the material of the lens is 1.5.
4) Two thin convex lenses each of focal length 10 cm are placed co-axially at a distance of 10 cm apart. Calculate equivalent focal length of given combination of lenses and locate all six cardinal points.
5) Two thin convex lenses each of focal length 8 cm are kept co-axially and separated by a distance 20 cm from each other. Find position of principal points.
6) Give sign conventions that are used in geometrical optics for ray diagram.

Q3. Attempt ANY TWO. **(8)**

1) Explain achromatic doublet that is achromatic combination of two lenses in contact.
2) A thin converging lens and thin diverging lens are placed co-axially at a distance of 6 cm apart. If focal length of each lens is 10 cm. find (i) equivalent focal length of combination of lenses and (ii) position of the principal points.
3) Write note on Optical Instruments.
4) Two thin convex lenses each of focal length 10 cm are placed co-axially at a distance of 10 cm apart. Calculate equivalent focal length of given combination of lenses and locate all six cardinal points.

||**********||*||**********||

Seat No. [ ]

Total No. of Questions: 03

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Anekant Education Society's

TULJARAM CHATURCHAND COLLEGE OF ARTS, SCIENCE AND COMMERCE, BARAMATI

(Autonomous Status)

Affiliated to Savitribai Phule Pune University, Pune

S.Y.B.Sc. PHYSICS

Semester-III

PHY-211-MN: THERMOMETRY

(NEP 2023 Pattern)

Time: 1:00 Hours] **[Max. Marks: 30**

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Instructions to the candidates:

i) All questions are compulsory

ii) Draw neat labelled diagrams wherever necessary

iii) Figures to the right indicate full marks

iv) Use of calculator is allowed

Q1. Answer the following. All questions are compulsory.

A) Select correct alternative and rewrite the sentence. **(4)**

i) Which thermometer is based on the expansion and contraction of a liquid?

A) Thermocouple thermometer

B) Gas thermometer

C) Mercury-in-glass thermometer

D) Infrared thermometer

ii) Which of the following is the correct definition of thermometry?

A) The study of pressure measurement

B) The science of measuring temperature

C) The study of heat transfer

D) The study of electrical resistance

iii) Which property is utilized in a thermocouple to measure temperature?

A) Electrical resistance

B) Thermal expansion

C) Electromotive force (EMF)

D) Color change

iv) Which of the following is a non-contact method of measuring temperature?

A) Thermistor

B) Thermocouple

C) Mercury thermometer

D) Infrared thermometer

B) Answer in short. **(6)**

a) Write general definition of calibration of instrument.
b) What is the main advantage of using a platinum resistance thermometer?
c) List different temperature scales used in temperature measurement.

Q2. Answer the following (ANY FOUR) **(12)**

1. Write an experimental method to calibrate liquid in glass thermometer (Mercury thermometer).
2. Write different thermometric properties that can be used to construct thermometer.
3. What are the advantages of using RTDs.
4. What are the limitations of using an alcohol thermometer?
5. Explain the working principle of a thermocouple thermometer.
6. How does temperature measurement help in the study of thermodynamics?

Q3. Answer the following (ANY TWO) **(8)**

1. Describe the methods used for calibrating different types of thermometers, such as liquid-in-glass, digital, and thermocouples, and explain the importance of calibration for ensuring accurate temperature measurement.
2. Analyze the advantages and disadvantages of digital thermometers compared to traditional liquid-in-glass thermometers. Include aspects such as response time, precision, ease of use, and environmental impact.
3. Discuss the design and functioning of infrared thermometers. Explain how they detect thermal radiation, the factors that affect their accuracy (such as emissivity and distance), and the situations where they are most suitable for temperature measurement.
4. Describe the construction and working principle of a platinum resistance thermometer (PRT). Discuss its advantages and limitations.

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Seat No. :

[Total No. of Questions: 03] Total No. of Pages: 2

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
(Empowered Autonomous Status)
Affiliated to Savitribai Phule Pune University, Pune
S.Y.B.Sc. Physics
Semester-IV
PHY-252-MJM: Digital Electronics
(NEP 1.0: 2023 PATTERN)

Time: 1.00 hours **No. of Credits-02** **Max. Marks: 30**

Instructions to Candidates:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Neat diagrams must be drawn wherever necessary.
4. Use of calculator is allowed.

Q 1: (A) Attempt each of the following. **(1 Mark each)**

a) Define half adder. [1]

b) Draw symbols of any two gates. [1]

c) What is logic Gates? [1]

d) Define flip-flops. [1]

Q 1: (B) Attempt each of the following. **(2 Mark each)**

a) State the types of basic logic gates. [2]

b) Define SOP and POS form in Boolean algebra. [2]

c) Differentiate between a Multiplexer and a Demultiplexer. [2]

Q 2: Attempt any <u>FOUR</u> of the following. **(3 Mark each)**

a) Show that $A + \bar{A}B = A + B$ [3]

b) Convert the following hexadecimal numbers to Decimal numbers: [3]
   i. E5 ii. B4D iii. F8E6

c) Draw and explain a 4:1 Multiplexer with its truth table and applications. [3]

d) Explain the 2's complement method for binary subtraction with an example. [3]

e) Design a Full Adder circuit and derive its Boolean expression. [3]

f) Explain the concept of a Parallel-In Parallel-Out (PIPO) shift register with a diagram. [3]

P.T.O.

Q 3: Attempt any <u>TWO</u> of the following. **(4 Mark each)**

a) Simplify (i) $\overline{(A+B)}+\bar{C}$ [4]

(ii) $\overline{AB}+\bar{A}+AB$

b) State and prove Demorgan's theorems. [4]

c) Draw a circuit symbol & write the truth table, Boolean equation for following gates: [4]
1) AND 2) OR 3) NOR 4) NAND

d) Describe the working of JK Flip-Flop with a truth table. [4]

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Total No. of Pages: 02
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Anekant Education Society's
TULJARAM CHATURCHAND COLLEGE OF ARTS, SCIENCE AND COMMERCE,
BARAMATI
(Autonomous Status)
Affiliated to Savitribai Phule Pune University, Pune
S.Y.B.Sc. PHYSICS
Semester-IV
PHY-253-MJM: Advanced Optics
(NEP2023 Pattern)

Time: 1.00 Hour] [Max. Marks: 30

structions to the candidates:
All questions are compulsory
Draw neat labelled diagrams wherever necessary
Figures to the right indicate full marks
Use of calculator is allowed

(10)

.1. All questions are compulsory

) Select correct alternative and rewrite the sentence. (4x1)

_____ is the phenomenon of bending of light wave at the edge of obstacle.
Diffraction b) reflection c) polarization d) interference

) In _____diffraction, source of light and the screen are at infinite distance from the obstacle.
) Fraunhoffer's b) Fresnel's c) Michelson's d) None of these

ii) Brewster's law is given by equation _____
) $\mu=\tan\Theta_p$ b) $\mu=\cos\Theta_p$ c) $\mu=\sin\Theta_p$ d) $\mu=\cot\Theta_p$

v) Emergent intensity of light beam from analyser is given by equation $I_\Theta=I_0\cos^2\Theta$ and called as
a) Malus's law b) Brewster's law c) Stoke's treatment d) None of these

B) Answer the following questions (3x2)

i) What do you mean constructive and destructive interference?
ii) Draw schematic diagram of Michelson's interferometer with labels.
iii) Calculate refractive index of material, if polarizing angle for air and transparent material $\Theta_p=60^o$?

(12)

Q.2. Answer any *four* questions (4x3)

i) Discuss interference in thin film due to reflected light and give condition for minima and maxima.
ii) A parallel beam of sodium light of wavelength 5890 Å is incident on a thin film of refractive index 1.5, such that angle of refraction into film is 60^o. Calculate smallest thickness of film which will make it appear dark by reflection.

iii) Newtons' rings are formed between plane glass plate and plano-convex lens of radius 60 cm. if diameter of 3rd bright ring is 0.0018 m and that of 23rd bright ring is 0.005 m, calculate wavelength of light.

iv) Briefly distinguish between Fresnel's and Fraunhoffer's diffraction with neat diagram.

v) Monochromatic light of wavelength 6000 Å is incident normally on a diffraction grating. The first order maximum is observed in the direction of 15'. Calculate the grating element

vi) Explain study of polarization with tourmaline crystal plates with suitable diagrams.

Q.3. Attempt any *two* questions (2x4)

i) Discuss Brewster's law for plane polarized light by method of reflection. What is polarizing angle for light incident from water to glass and glass to water if refractive index of glass and water is 1.54 and 1.33 respectively? **(08)**

ii) Explain Law of Malus regarding intensity variation of plane polarized light with suitable diagram.

iii) White light is incident on soap film at angle $\sin^{-1}(4/5)$ and reflected light on examination shows dark bands. Two consecutive dark bands corresponding to wavelengths 6.1×10^{-5} and 6×10^{-5} cm. If refractive index of film is 1.33, calculate its thickness.

iv) Write down difference between interference and diffraction phenomena of light.

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Total No. of Questions: 03

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Total No. of Pages: 02

Anekant Education Society's
TULJARAM CHATURCHAND COLLEGE OF ARTS, SCIENCE AND COMMERCE, BARAMATI
(Autonomous Status)
Affiliated to Savitribai Phule Pune University, Pune
Class: S.Y. B.Sc. Physics (Minor) Semester-IV
PHY-261-MN : Atoms and Molecules
(2023 Pattern)

Time:1.00 Hours *No. of Credits -2* **[Max. Marks: 30]**

Instructions to the candidates:
i) All questions are compulsory
ii) Neat labeled diagrams must be drawn wherever necessary
iii) Figures to the right indicate full marks
iv) Use of scientific calculator is allowed

Q1 (A) Attempt each of the following. **(4)**

i) Which element was primarily used in Rutherford's gold foil experiment?
a) Hydrogen b) Gold c) Oxygen d) Helium.

ii) Which type of bond involves the transfer of electrons from one atom to another?
a) Covalent bond b) Ionic bond c) Metallic bond d) Hydrogen bond.

iii) Which of the following could not be explained by Rutherford's model?
a) The existence of atoms b) The continuous emission spectrum
c) The discrete energy levels of electrons d) The existence of the electron cloud

iv) According to Rutherford's model, the mass of an atom is concentrated in the:
a) Electrons b) Nucleus c) Electron cloud d) Orbitals

(B) Attempt each of the following. **(6)**

i) What are some common applications of lasers in medicine?
ii) What experimental evidence led to the rejection of Thomson's model of the atom?
iii) Write three postulates of Bohr's atomic model.?

Q2. Attempt ANY FOUR of the following. **(12)**

i) What are the key features of the Thomson Model of the atom?
ii) Explain the significance of hydrogen bonding in water molecules.
iii) Describe Rutherford's model of the atom and its significance.
iv) What are the key forces that exist between atoms in a molecule?
v) How does Bohr's model differ from Rutherford's atomic model?
vi) What was the main conclusion from Rutherford's gold foil experiment?

Q3. Attempt ANY TWO of the following. **(8)**

i) What is the basic principle behind bonding mechanisms in molecules?
ii) Explain with schematic diagram construction of Helium-Neon laser.
iii) Explain how population inversion is attained in laser operation?
iv) Discuss industrial applications of Lasers.

Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati

(Autonomous Status)

S.Y.B.Sc.

Subject: USPH-232:(B) INSTRUMENTATION

(FRESH) (2022 PATTERN)

Time:2.30 Hours Max. Marks: 60

Instructions to Candidates:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Neat diagrams must be drawn wherever necessary.
4. Use of calculator is allowed.

Q 1: Attempt the following.

a) What is linearity of the Instruments? [1]

b) The full form of LED is ---------- [1]

c) State the principle used in variable resistance transducer. [1]

d) Define the accuracy of the instrument. [1]

e) When the input voltage of an instrument changes from 08 V to 10 V, corresponding output voltage changes from 48 V to 60 V. What will be sensitivity of the instrument? [2]

f) What do you mean by analog and digital filters? [2]

g) Define Atmospheric pressure and Absolute pressure. [2]

h) What is difference between PTC & NTC? [2]

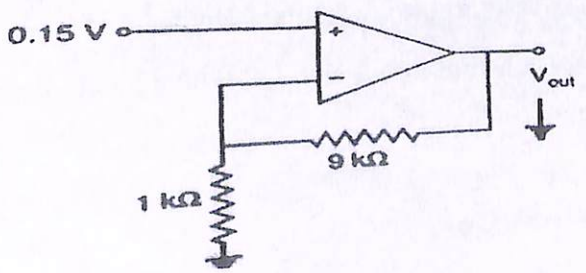
Q 2: Attempt any <u>THREE</u> of the following.

a) Write a note on C-Type Bourdon Tube. [4]

b) A sine wave of 0.5V is applied to an inverting amplifier using Ri=2kΩ and Rf=20 kΩ. Find the output voltage. [4]

c) Determine the temperature of platinum wire, when the resistance of the wire at 100 °C is 140.5 Ω and 0 °C is 100 Ω. (Temperature Coefficient of platinum is 0.0039 /° C). [4]

d) What is the output of the following circuit. [4]



P.T.O.

Q 3: Attempt any TWO of the following.

a) Derive the expression for the voltage to current converter showing load current depends on the input voltage. [6]

b) What is strain gauge? Explain the working of bounded strain gauge. [6]

c) Explain thermal element as an example of first order instrument. [6]

Q 4: Attempt any TWO of the following.

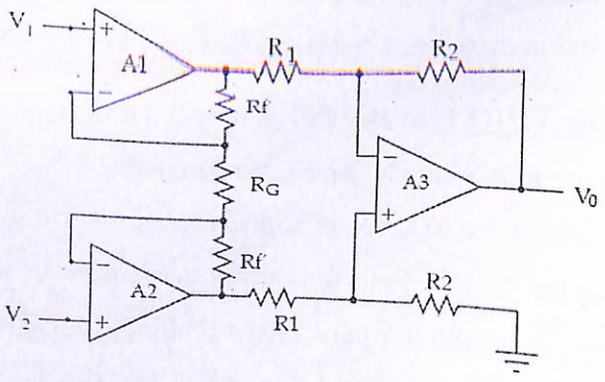
a) Explain with neat diagram, principles, and working of LVDT. [6]

b) Draw neat diagram of variable reluctance transducer and explain its working in detail. [6]

c) Explain OPAMP as a Non-Inverting amplifier and derive the equation for output voltage. [6]

Q 5: Attempt any ONE of the following.

a) With the help of neat diagram, explain Instrumentation amplifier using three op-amp. In the instrumentation amplifier of figure below [12]



If R_G=5 kΩ, R_F= 10 kΩ, R_1=1 kΩ, R_2=2 kΩ. What is the output voltage if $V_{in}=V_2-V_1$= 1mV?

b) What are the functional elements of a measurement system? Explain each functional element with a block diagram. [12]

(2)

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Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati.

(Autonomous)

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S.Y.B.Sc.

MATHEMATICS

Semester – III

MAT-211-MN: *Foundation of Linear Algebra*

(2023 Pattern)

Time: 1 Hour] [***Max. Marks: 30***

Instructions to the Candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of non-programmable scientific calculator is allowed.***

***Q1*) A)** Attempt the following. (*1 mark each*) [04]

a) Define the Range of linear transformation.

b) If $\bar{v} = (5, 6)$ in $\mathbb{R}^2$ then Find $\|\bar{v}\|$.

c) Is the set of all rational numbers a vector space over $\mathbb{R}$ under usual addition and scalar multiplication?

d) Write the dimension of $M_{m\times n}$.

B) Attempt the following. (*2 mark each*) [06]

a) Write the standard basis for P_3 (Polynomials of degree less equal 3).

b) Define Subspace.

c) If $\bar{u} = (1, 2, 3)$ and $\bar{v} = (-2, 0, 5)$ in $\mathbb{R}^3$ then find $\bar{v} \cdot \bar{u}$.

***Q2*)** Attempt any *FOUR* of the following. (*3 mark each*) [12]

a) For what value of k the vectors $\bar{V}_1 = (1, -2)$ and $\bar{V}_2 = (-5, k)$ are linearly independent in $\mathbb{R}^2$.

b) Let $T: V \to \mathbb{R}^3$ is linear transformation for which, $T(\bar{u}_1) = (2, -1, 2)$, $T(\bar{u}_2) = (3,0,2)$, $T(\bar{u}_3) = (-2,1,3)$ then Find $T(4\bar{u}_1 + \bar{u}_2 - 3\bar{u}_3)$.

c) Find a unit vector in the direction of the vector $\bar{u} = (1,1,2)$.

d) Let $V = \mathbb{R}^3$, $S = \{(3,1,-4), (2,5,6), (1,4,3)\}$. Determine whether S is basis for V.

e) Find the standard matrix of the following linear transformation $T: \mathbb{R}^2 \to \mathbb{R}^2$. $T(x, y) = (y, x)$.

f) If $\bar{u} = (2, -5, -1)$ and $\bar{v} = (-7, -4, 6)$ in $\mathbb{R}^3$ then compute $\bar{u} \cdot \bar{v}$, $\|\bar{u}\|^2$, $\|\bar{v}\|^2$, $\|\bar{u} + \bar{v}\|^2$.

P.T.O.

Q3) Attempt any *TWO* of the following. (*4 mark each*) [08]

a) Prove that $\|\bar{u}+\bar{v}\|^2+\|\bar{u}-\bar{v}\|^2=2\|\bar{u}\|^2+2\|\bar{v}\|^2, for\ \bar{u},\bar{v}\in\mathbb{R}^n$.

b) Find the cosine of the angle between $\bar{u}$ and $\bar{v}$ where $\bar{u}=(2,1,7,-1)$ and $\bar{v}=(4,0,0,0)$.

c) Find the value of K for which vector $\bar{u}=(1,-2,K)$ in $\mathbb{R}^3$ is linear combination of the vectors $\bar{v}=(3,0,-2)$and $\bar{w}=(2,-1,-5)$.

d) Let $T:\mathbb{R}^2\rightarrow\mathbb{R}^2$ is linear transformation defined by $T(x,y)=(x+1,y+2)$. Determine whether T is a linear transformation.

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Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati.

(Autonomous)

Affiliated to Savitribai Phule Pune University, Pune.

S.Y.B.Sc.

MATHEMATICS

Semester – III

MAT-221-VSC: *Financial Mathematics*

(2023 Pattern)

Max. Marks: 30

Time: 1 Hours

Instructions to the Candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of non-programmable scientific calculator is allowed.***

Q1) **A)** Attempt the following. (*1 mark each*) [04]

a) Write the formula for revenue function.

b) Write down the condition for finding the startup point.

c) Suppose the market for a commodity is governed by demand sets defined as follows. The demand set D is the set of pairs (q, p) for which $q + 2p = 40$. Determine the demand function q^D.

d) Write down the formula for present value of annuity.

B) Attempt the following. (*2 mark each*) [06]

a) Without solving any equations, determine whether the cobweb model predicts stable or unstable equilibrium for the market with $q^S(p) = 0.05p - 4, q^D(p) = 18 - p$.

b) Describe in words the behavior of the following sequences as $t \to \infty$

i. $\frac{1}{3^t}$

ii. $(1.001)^t$

c) Suppose that the supply and demand sets S and D, for a particular market are described as follows: S consists of the pairs (q, p) such that $p - 3q = 2$ and D consists of the pairs (q, p) such that $p + q = 2$. Determine inverse supply function and inverse demand function.

Q2) Attempt any *FOUR* of the following. (*3 mark each*) [12]

a) What is the present value of an annuity generating \$10000 a year for the next seven years, given the fixed interest rate of 8%?

b) What are the maximum and minimum values of the function $f(x) = x^3 - 8x^2 + 16x - 1$ in the interval [0, 2]?

c) Find the solution of the recurrence equation $3y_t = 2y_{t-1} + 10$, when $y_0 = 25$ and describe it's behavior as $t \to \infty$.

P.T.O.

d) Find critical points of the function $f(x) = x^3 - 6x^2 + 2x + 200$.

e) Consider an efficient small firm with cost function $C(q) = 600 + 40q - 2q^2 + q^3$. Find profit function.

f) An amount of \$2000 is an invested and attracts interest at a rate equivalent to 7% per annum. Find the total after one year if the interest is compounded (a) annually (b) quarterly (c) monthly.

Q3) Attempt any *TWO* of the following. (*4 mark each*) [08]

a) Suppose that you have won a competition in a national news-paper and you can choose either to receive a lump sum of \$100000 now or a payment of \$20000 at the end of each year for the next seven years. Which prize should you choose, assuming that the highest interest rate you can obtain is a constant 7% over the seven year period?

b) Suppose that Alpern and Co. is an efficient small firm which cannot produce more than 6 units of its product each week. If their cost function is $C(q) = 100 + 20q - 6q^2 + q^3$. Determine: (a) their fixed cost(b) their profit function (c) their startup point (d) their breakeven point.

c) Suppose that you have just inherited an asset whose current market value is \$2000. Assume that the market value will increase steadily at a rate of \$300 per annum, and that the interest on a bank deposit will be compounded continuously at the equivalent annual rate of 6%. Explain why the present value of the amount realised by selling the asset after t years is $p(t) = (2000 + 300t)e^{-0.06t}$ and determine the optimum time to sell.

d) Solve the following simultaneous equation.

$$x - 2y = 3$$
$$3x + 5y = 20$$

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Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati.

(Autonomous)

Affiliated to Savitribai Phule Pune University, Pune.

S.Y.B.Sc.

MATHEMATICS

Semester – IV

MAT-251-MJM: *Vector Calculus*

(NEP 2020, 2023 Pattern) (Paper – I)

Time: 1 Hours] [***Max. Marks: 30***

Instructions to the Candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of Non-programmable scientific calculator is allowed.***

***Q1*) A)** Attempt the following. (*1 mark each*) [04]

a) State Fubini's theorem for double integral.

b) Give the relation between Cartesian and cylindrical coordinates.

c) Find the gradient vector field of $f(x, y) = \ln(x + 2y)$.

d) If $\bar{F}(x, y, z) = xz\bar{\imath} + xyz\bar{\jmath} - y^2\bar{k}$, then find div $\bar{F}$.

B) Attempt the following. (*2 mark each*) [06]

a) Evaluate $\int_1^3 \int_0^1 (1 + 4xy)dx\,dy$.

b) Find the Jacobian for the transformation $x = u^2 - v^2$, $y = 2uv$.

c) State the Green's theorem.

***Q2*)** Attempt any *FOUR* of the following. (*3 mark each*) [12]

a) Evaluate $\iint_D xy\,dA$, where D is the disk with center origin and radius 3.

b) Find the area enclosed by one loop of the four-leaved rose $r = \cos 2\theta$.

c) Evaluate $\int_0^1 \int_0^z \int_0^{x+z} 6xydy\,dx\,dz$.

d) Find the volume of the part of the ball $\rho \leq a$ that lies between the cones $\phi = \pi/6$ and $\phi = \pi/3$.

e) Evaluate $\oint_C (3y - e^{\sin x})dx + \left(7x + \sqrt{y^4 + 1}\right)$, where C is the circle $x^2 + y^2 = 9$.

f) Show that the vector field $\bar{F}(x, y, z) = y^2z^3\bar{\imath} + 2xyz^3\bar{\jmath} + 3xy^2z^2\bar{k}$ is a conservative.

***Q3*)** Attempt any *TWO* of the following. (*4 mark each*) [08]

a) Evaluate $\int_0^1 \int_x^1 \sin(y^2)\,dy\,dx$.

b) Evaluate $\int_{-2}^2 \int_{-\sqrt{4-x^2}}^{\sqrt{4-x^2}} \int_{\sqrt{x^2+y^2}}^2 (x^2 + y^2)dy\,dx\,dz$.

c) State and prove the fundamental theorem for line integrals.

d) Evaluate $\iint_S y\,dS$, where S is the surface $z = x + y^2$, $0 \leq x \leq 1$, $0 \leq y \leq 2$.

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Total No. of Questions: 03

Seat No:

Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati

(Autonomous)

Class: S.Y.B.Sc. (Mathematics)

MAT-252-MJM: Linear Algebra

(NEP Pattern-2023 Pattern) (Paper-II) (Semester-IV)

Time: 1 Hour *Total Marks:30*

Instructions to the Candidates:

1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*

Q.1] A) Attempt each of the following. [4]

i) Define: Linearly independent set
ii) Define: Basis
iii) Is the set $\{(1,2), (2,4)\}$ linearly independent in $\mathbb{R}^2$?
iv) State Cauchy-Schwarz inequality

B) Attempt each of the following. [6]

i) Find eigenvalues of the matrix $\begin{bmatrix} 3 & 1 \\ 0 & 4 \end{bmatrix}$

ii) Give basis of $\mathbb{R}^3$ which contains the vector $(1, 0, 1)$.

iii) Let $T: V \to W$ be linear map then prove that $T(-x) = -T(x)$.

Q.2] Attempt any four of the following. [12]

i) Is union of two subspaces again a subspace? Justify.
ii) Let $T: \mathbb{R}^2 \to \mathbb{R}^2$ is given by $T(x, y) = (y, x)$. Is T linear map? Justify.
iii) Define: Inner product
iv) Prove that $\|x + y\| \leq \|x\| + \|y\|$

v) Justify. What is the determinant of

$$\begin{bmatrix} 1 & 2 & 3 & 1 & 2 & 3 \\ 4 & 5 & 6 & 4 & 5 & 6 \\ 7 & 8 & 9 & 7 & 8 & 9 \\ 1 & 2 & 3 & 1 & 2 & 3 \\ 4 & 5 & 6 & 7 & 8 & 9 \\ 7 & 8 & 9 & 1 & 2 & 3 \end{bmatrix}$$

vi) What are all vector subspaces of $\mathbb{R}$?

Q.3] Attempt any <u>two</u> of the following. **[8]**

i) ~~Let V be a finite dimensional vector space then prove that any two bases of V have~~ same number of elements

ii) Let $S = \left\{ \begin{bmatrix} x & y \\ 0 & 0 \end{bmatrix} \mid x, y \in \mathbb{R} \right\}$ denote the set of symmetric matrices in $M(2, \mathbb{R})$. Show that S is a vector subspace of $M(2, \mathbb{R})$.

iii) Verify Cayley-Hamilton theorem for $\begin{bmatrix} 3 & 1 \\ -1 & 4 \end{bmatrix}$

iv) State Rank-Nullity theorem and verify it for one example.

Seat No.: [ ]

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Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati.

(Autonomous)

Affiliated to Savitribai Phule Pune University, Pune.

S.Y.B.Sc.

MATHEMATICS

Semester – IV

MAT-253-MJM: *Operations Research*

(2023 Pattern)

Time: 1 Hours **Max. Marks: 30**

Instructions to the Candidates:

1) **All questions are compulsory.**
2) **Figures to the right indicate full marks.**
3) **Use of Non-programmable scientific calculator is allowed.**

Q1) (A) Attempt **each** of the following.(1 Marks each) [04]

a) Define feasible solution.
b) Define alternative assignment problem.
c) What is mean by degeneracy in solution of transportation problem?
d) Define redundant constraint.

(B) Attempt **each** of the following.(2 Marks each) [06]

a) Convert the following linear programming problem into standard form:

$$Max\ Z = -2x_1 - 4x_2 - x_3$$

Subject to the constraints,

$$x_1 + 2x_2 - x_3 \leq 5$$
$$2x_1 - x_2 + 2x_3 = 2$$
$$-x_1 + 2x_2 + 3x_3 \geq 1$$
$$x_1, x_2, x_3 \geq 0.$$

b) Define non-degenerate basic feasible solution in transportation problem.
c) Explain primal-dual relationship.

Q2) Attempt any ***Four*** of the following. (*3 mark each*) [12]

a) Use least cost method to find initial basic feasible solution of the following transportation problem:

P.T.O.

Source	Destination				Supply
	P	Q	R	S	
A	30	25	40	20	100
B	29	26	35	40	250
C	31	33	37	30	150
Demand	90	160	200	50	

b) Solve the following linear programming problem graphically:

$$Maximize\ Z = 6x_1 - 4x_2$$

Subject to the constraints,

$$2x_1 + 4x_2 \leq 4$$
$$4x_1 + 8x_2 \geq 16$$
$$x_1, x_2 \geq 0$$

c) Solve the following assignment problem:

	I	II	III
A	6	4	5
B	2	11	4
C	13	8	3

d) Obtain the dual of following liner programming problem:

$$Maximize\ Z = 3x_1 - 2x_2 + 4x_3$$

Subject to the constraints,

$$3x_1 + 5x_2 + 4x_3 \geq 10$$
$$7x_1 - 2x_2 - x_3 \leq -5$$
$$x_1 - 2x_2 + 5x_3 \geq -1$$
$$4x_1 + 7x_2 - 2x_3 \geq 5$$
$$x_1, x_2, x_3 \geq 0$$

e) Check whether the given solution for minimization is optimal or not, if not then optimize it.

C_B	$C_j \rightarrow$	4	1	0	0	M	M	B	Minimum
	X_B	X_1	X_2	S_1	S_2	R_1	R_2	Constant	Ratio
4	X_1	1	0	1/5	0	3/5	−1/5	3/5	3
1	X_2	0	1	−3/5	0	−4/5	3/5	6/5	–
0	S_2	0	0	[1]	1	1	−1	1	1
	Z_j	4	1	1/5	0	8/5	−1/5	18/5	
	$Z_j - C_j$	0	0	1/5	0	8/5 − M	−1/5 − M		

f) Solve the following linear programming problem graphically:

$$Maximize\ Z = 3x_1 + 2x_2$$

Subject to the constraints,

$$2x_1 + x_2 \leq 2$$
$$3x_1 + 4x_2 \geq 12$$
$$x_1, x_2 \geq 0$$

Q3) Attempt any ***TWO*** of the following. (*4 mark each*) [08]

a) Use Vogel's approximation method to find initial basic feasible solution of the following transportation problem:

Source	Destination				Supply
S_1	19	30	50	10	7
S_2	70	30	40	60	9
S_3	40	8	70	20	18
Demand	5	8	7	14	

b) Solve the following linear programming problem by graphical method.

$$Max\ z = 9x + 13y$$

Subject to,

$$2x + 3y \leq 18$$
$$2x + y \leq 10$$
$$x, y \geq 0.$$

c) Solve the following linear programming problem by simplex method.

$$Max\ z = 2x_1 + 4x_2$$

Subject to,

$$x_1 + 2x_2 \leq 5$$
$$x_1 + x_2 \leq 4$$
$$x_1, x_2 \geq 0.$$

d) Solve the following assignment problem for minimization where no assignment can be of job 1 to machine A:

	Machines				
Jobs	A	B	C	D	E
1	–	4	7	3	4
2	4	2	6	3	4
3	7	6	5	7	5
4	3	3	7	6	7
5	4	4	5	7	3

♦ ♦ ♦

Seat No.: [ ]

Total No. of Questions: 03 Total No. of Pages: 02

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S.Y.B.Sc.

MATHEMATICS

Semester – IV

MAT-261-MN: Multivariable Calculus

(2023 Pattern)

Time: 1 Hours *Max. Marks: 30*

Instructions to the Candidates:

1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Use of non-programmable scientific calculator is allowed.*

Q1) **A)** Attempt **each** of the following. (*1 mark each*) [04]

a) Find the unit vector in the direction of the vector $2i - j - 2k$.

b) If $a = (4,0,3)$ and $b = (-2,1,5)$ then find the vector $2a + 5b$.

c) Calculate f_x , if $f(x,y) = x^3 + x^2y^3 - 2y^2$.

d) State Stoke's theorem.

B) Attempt **each** of the following. (*2 mark each*) [06]

a) If $z = x^2y + 3xy^4$ where $x = \sin(2t)$ and $y = \cos t$ then find $\frac{dz}{dt}$.

b) Find curl of the vector field $f(x,y,z) = (xyz)\,i - (x^2y)\,k$.

c) Calculate the iterated integral $\int_1^4 \int_0^2 (6x^2y - 2x)\,dydx$.

Q2) Attempt any ***FOUR*** of the following. (*3 mark each*) [12]

a) Find the velocity, acceleration and speed of a particle with position vector $r(t) = (t^2, e^t, te^t)$.

b) Find the tangent plane to the elliptic paraboloid $z = 2x^2 + y^2$ at point (1,1,3) .

c) Sketch the vector field on $\mathbb{R}^2$ defined by $f(x,y) = x\,i + y\,j$.

d) Show that a function $u(x,t) = \sin(x - at)$ satisfies wave equation.

e) Evaluate $\int_C y\,dx + z\,dy + x\,dz$, where c consists of the line segment from (2,0,0) to (3,4,5).

f) Evaluate $\iint_D (x^2 + y^2)dA$ where $D = \{(x,y)/0 \le x \le 2,\ x^2 \le y \le 2x\}$.

Q3) Attempt any ***TWO*** of the following. (*4 mark each*) [08]

a) Find the unit normal and binormal vectors for $\boldsymbol{r}(t) = \cos t\, \boldsymbol{i} + \sin t\, \boldsymbol{j} + t\boldsymbol{k}$.

b) Find gradient vector field of $f(x, y) = x^2 + y^2$ and plot the gradient vector field.

c) Sketch the level curves of the function $f(x, y) = x - y$ for the values $k = 0,1,2,3$.

d) Evaluate triple integral $\iiint_E z\, dv$ where

$$E = \{(x, y, z)/0 \leq x \leq 1, 0 \leq y \leq 1 - x, 0 \leq z \leq 1 - x - y\ \}$$

Seat No.: [ ]

Total No. of Questions: 05 **Total No. of Pages: 02**

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S.Y.B.Sc.

MATHEMATICS

Semester – IV

MAT 2401: *Linear Algebra*

(2019 Pattern) (Paper – I)

Time: 2 Hours] [*Max. Marks: 60*

Instructions to the Candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

Q1) **A)** Attempt each of the following. [4]

a) Define: Basis.
b) Define: Orthonormal vectors.
c) What is dimension of P_5 the vector space of all polynomial with real coefficients and degree less than equal to 5 ?
d) Define: Rank of linear transformation

B) Attempt each of the following. [8]

a) Find angle between vectors $u = (1,1)$ and $v = (1,-1)$ in an Euclidean inner product space $\mathbb{R}^2$.

b) Let $W = \{(x,y,z) \in \mathbb{R}^3 \mid x+y+z = 0\} \subseteq \mathbb{R}^3$. Is W a subspace of $\mathbb{R}^3$?

c) Show that the set $S = \{1, 2x, 3x^2\}$ is linearly independent subset of P_2.

d) Find linear span of the set $S = \{(1,2),(1,0)\} \subseteq \mathbb{R}^2$.

Q2) Attempt any *THREE* of the following. [12]

a) Let V be an inner product space. Prove that,
$||x+y||^2 + ||x-y||^2 = 2(||x||^2 + ||y||^2)\ \forall\ x, y \in V$.
b) Show that the set, $\{(1,0,0).(0,1,2),(1,2,3)\}$ is basis of $\mathbb{R}^3$.
c) Find dimension of the vector subspace, $S = \{(x,y,z) \in \mathbb{R}^3 / x+y = 0, z+y = 0\}$.
d) Let $T: V \to W$ be a linear transformation then prove that $Im(T)$ is a subspace of W.

Q3) Attempt any *TWO* of the following. [12]

a) Find standard matrix of the linear transformation, $T: \mathbb{R}^3 \to \mathbb{R}^3$ given by,
$$T(x, y, z) = (x, x + y, x + y + z)$$

b) If W_1 and W_2 are subspaces of V then prove that ,the set $W_1 \cap W_2$ is vector subspace of V. Is $W_1 \cup W_2$ a vector subspace of V.

c) For $x, y \in \mathbb{R}^2$, Define $< x, y >= x_1y_1 + x_2y_2$ where $x = (x_1, x_2)$ and $y = (y_1, y_2)$. Show that, this defines an inner product space on $\mathbb{R}^2$.

Q4) Attempt any *TWO* of the following. [12]

a) Let $T: V \to W$ be a linear transformation. Prove that T is an isomorphism if and only if $Ker(T) = \{\bar{0}\}$ and T is onto..

b) Let V be a vector space and dim(V)= n. Prove that any linearly independent set of vectors can be extended to form a basis.

c) Find all eigenvalues of the matrix, $\begin{pmatrix} 1 & 3 & 1 \\ 2 & 1 & 1 \\ 0 & 1 & 4 \end{pmatrix}$.

Q5) Attempt any *ONE* of the following. [12]

a) State Rank –Nullity theorem for linear transformation. Also Find range and kernel of the linear transformation $T: \mathbb{R}^3 \to \mathbb{R}^3$ defined by,
$$T(x, y, z) = (x + y + 2z, x + z, y + 2z).$$

b) Apply Gram Schmidt process to obtain an orthonormal set of $\{(1,2,3), (-1,1,2), (0,0,1)\}$ in an Euclidean Space $\mathbb{R}^3$.

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(2)

Exam. Seat No. [ ]

Total No. of Questions: 3 Total No. of pages: 2

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S. Y. B. Sc.
Chemistry
Semester- III
CHE-201- MJM: Physical Chemistry-I
(NEP 2023 Pattern)

Time: One Hour **(No of Credits 02)** **Max. Marks: 30**

Instructions to the candidates:

i. *All questions are compulsory*
ii. *Figures to the right indicates full marks*
iii. *Use of calculator /logarithmic table is allowed.*

Q.1. (A) Attempt <u>each</u> of the following. **(1 Mark each)**

i) Define – Chemical Kinetics.
ii) Calculate the order of reaction having rate law as, Rate = $k [A]^{1/2} [B]^{1/2} [C]^{1}$
iii) Give any one statement of second law of thermodynamics.
iv) Write the mathematical expression for relation between Rate constant and Half life period for second order reaction.

(B) Attempt <u>each</u> of the following. **(2 Marks each)**

i) What is mathematical expression of first order rate constant? State its unit.
ii) Calculate the Half life period of first order reaction having rate constant, $1.80 \times 10^{-5} S^{-1}$.
iii) Define and explain the concept of activation energy.

Q.2. Attempt any <u>four</u> of the following. **(3 Marks each)**

i) Show that, $\Delta A = - W_{max.}$

ii) Explain any two factors affecting the rate of a chemical reaction.

iii) Define and explain with example, - pseudo molecular reaction

iv) State and explain the characteristics of first order reaction.

v) A first order reaction is 40% completed in 20 minutes. Find its rate constant.

Q.3. Attempt any <u>two</u> of the following. **(4 Marks each)**

i) Distinguish between Order and Molecularity of a chemical reaction.

ii) Derive an expression for free energy change (ΔG) during isothermal reversible expansion of an ideal gas

iii) Calculate the entropy change when 2 moles of an ideal gas expands isothermally from 10 liters to 100 litters at 298 K. ($R = 8.314\ J\ K^{-1}\ mol^{-1}$)

iv) State and explain the physical significances of entropy.

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[Total No. of Questions: 3] Seat No-

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S.Y.B.Sc

SEMESTER-III

CHEMISTRY

CHE-202-MJM Inorganic Chemistry-I

(NEP 1.0, 2023 Pattern)

Time: 1.00 hr.) **(No. of credits=02)** **(Max. Marks: 30**

Instructions to candidates:

I. All questions are compulsory.

II. Figures on the right indicate full marks.

III. *Neat diagrams must be drawn wherever necessary.*

Q.1 (A) Attempt **each** of the following [4]

i) Define dipole moment.

ii) What is lanthanide contraction?

iii) Write the electronic configuration of Cr.

iv) What is d-block element?

(B) Attempt **each** of the following [6]

i) Calculate the bond order of He_2 molecule.

ii) Define Acid according to Arrhenius theory.

iii) Write the electronic configuration of following species.

a) Cu^{2+} b) Ti^{+}

Q.2 Attempt **ANY FOUR** of the following [12]

i) Explain Lux-Flood concept of acid and base with suitable examples.

ii) Why d-block elements forms number of complexes.

iii) Draw the MO energy level dig for B_2 molecule.

iv) Explain elements of the d-block are generally called transitional metals.

v) Distinguish between VBT and MOT.

vi) Give the properties of solvent

PTO

Q.3 Attempt **ANY TWO of** the following [8]

i) Explain any three properties of d-block element.

ii) Give the electronic configuration for first row transition elements.

iii) Draw the MO diagram For H_2 molecule, calculate the bond order.

iv) Explain the advantages, limitations of Bronsted-Lowry theory.

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[Total No. of Questions: 3]

Seat No-

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S.Y.B.Sc

SEMESTER-III

CHEMISTRY

CHE-203-MJM: Organic Chemistry-I

(2023 NEP Pattern)

Time: 1.00 hr.) **(No. of credits=02)** **(Max. Marks: 30**

Instructions to candidates:

I. All questions are compulsory.

II. Figures on the right indicate full marks.

III. Neat diagrams must be drawn wherever necessary.

Q.1 (A) Attempt **each** of the following [4]

i) Define diastereomers.

ii) What is alcohol?

iii) Write the structure of- Ethanoic acid

iv) Define amines.

(B) Attempt **each** of the following [6]

i) Write the structure of trans-1,2 dimethyl cyclohexane.

ii) Why carboxylic acids have higher b.p. than alcohols?

iii) Give the IUPAC names of- 1. CH_3-CH=CH_2OH 2. CH_3-CH_2-NH-CH_3

Q.2 Attempt **any four** of the following [12]

i) Give the synthesis of ethyl alcohol from- 1. Ethene 2. Acetaldehyde

ii) Write a note locking of conformation.

iii) How benzoic acid is obtained from- 1. Benzaldehyde 2. Phenyl cyanide

iv) Describe Reimer-Tiemann reaction.

v) How aniline is obtained from- 1. Chlorobenzene 2. Nitro benzene

vi) Discuss the factors affecting the stability of conformations.

PTO

Q.3 Attempt **any two** of the following [8]

i) Give the classification of amines. Why amines are basic in nature?

ii) Explain with Newmann structure chair conformation more stable than boat conformation of cyclohexane.

iii) How phenol is obtained from-1. Chloro benzene 2. Sodium benzene sulphonate

iv) Predict the product A & B of the following reactions-

1. $H_3C-COOH \xrightarrow{PCl_5} A \xrightarrow{NH_3} B$

2. $H_3C-\overset{H_2}{\underset{}{C}}-OH \xrightarrow{Conc.H_2SO_4} A \xrightarrow{HBr} B$

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Exam. Seat No. .....

Total No. of Question: 3] [Total No. of Pages: 2

Anekant Education Society's
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S.Y.B.Sc. Chemistry (Sem. III) Examination [redacted]

Course Code: CHE- 211- MN **Course Title: Basic Concept of Chemistry-I**

(NEP1.0 2023Pattern)

Time: 1.30 Hours] **[No. of Credits: 02]** **[Max.Marks: 30**

Instruction to students:

4. All questions are compulsory and carry equal marks.
5. Figures to the right indicate full marks.
6. Neat and labeled diagram must draw wherever necessary.

Q.1. A) Attempt the following **(4 Marks)**

a) What is Aufbau principle?
b) Give ideal gas equation.
c) Define hydrocarbon.
d) Define ionization potential.

B) Answer the following **(6 Marks)**

a) Write the structure of propane and iso-butane.
b) Give the electronic configuration of Mn and Cr (atomic number Mn = 25, Cr = 24)
c) Define the terms i) Critical temperature ii) Critical pressure

Q.2 Attempt <u>any Four</u> of the following **(12 Marks)**

a) Explain the shapes and orientation of s and p orbitals.
b) Give any four properties of solids.
c) Give the physical properties of alkanes.
d) Explain the property reactivity of elements in the periodic table.
e) Explain the compressibility factor with respect to pressure.
f) Explain the effect of temperature on vapour pressure of liquid.

Q.3 Answer <u>any Two</u> of the following **(8 Marks)**

a) Give the schematic representation of periodic table and show the different blocks in periodic table.

b) Define viscosity of liquid. Discuss the method to measure viscosity of a liquid by Ostwald's viscometer.

c) Explain the trends in properties of periodic table with respect to following points
   i. Atomic and ionic size ii. Electronegativity

d) Calculate the pressure exerted by one mole of water vapour in 20 liters at 100 ^{0}C (Given : a = 5.52atm l^2 mol^{-1} , b = 0.0304 l mol^{-1} and R = 0.082 lit atm K^{-1} mol^{-1})

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S.Y.B.Sc. (CHEMISTRY)
Paper: - -CHE-221-VSC: Fundamentals of Analytical Chemistry
Semester- (III) Examination

[NEP 1.0 (2023 Pattern)]
(No.of Credits 02)

[Max.Marks:-30

Time-1.00 Hours]

Indications to the candidates:

i. All questions are compulsory
ii. Figures to the right indicates full marks
iii. Neat diagram must be drawn wherever necessary.
iv. Use of calculator /logarithmic table is allowed.

Q.1) **A).** Attempt each of the following. (1 Mark each)

i) What do you mean by quantitative analysis?
ii) Define Absolute error.
iii) Give an example of primary and secondary substances in volumetric analysis.
iv) What is the role of an indicator in titration?

B) Attempt each of the following. (2 Mark each)

i) Name two common techniques used in quantitative analysis.
ii) Explain the term accuracy and precision.
iii) Can you eliminate the error completely? Justify your answer.

Q.2) Attempt any Four of the following (3 Marks each)

i) Calculate the proper number of significant numbers in each of the following.
a) 34.945 , b)0.923 c)6000, d)6.006 e)1000 ml

f)4.6×10^5

PTO....

ii) What is pH? State the formula used to calculate pH. What is the principle of pH metry?
iii) What is the connection between analytical chemistry and other sciences?
iv) What are the characteristic features of standard substance?
v) What is the difference between normality and molarity? Explain the term basicity of acid and acidity of base
vi) Perform the addition and subtraction operation and express the result to the proper significant figure.
   a) 6.731+0.6731+5.0
   b) 0.00648+0.00593+0.00028+0.10649
   c) 46.6312– 46.5899

Q.3) Attempt any **Two** of the following (4 Marks each)

i) Explain the titration curve for strong acid and strong base. Discuss selection of suitable indicator.
ii) Give the transition range and colour in acid form and base form for-
   a) Methyl red b) Methyl orange c) Phenolphthalein d) Cango red
iii) The percentage of calcium in white powder is reported by the different expert's as-20.54, 21.03, 20.80, 20.58 and 20.92 calculate deviation, mean deviation, standard deviation and relative mean deviation of the result.
iv) Explain different ways of expressing the concentration of a solution.

Exam. Seat No.....

Total No. of Question: 3 Total No. of Pages: 2

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S.Y.B.Sc. Chemistry (Sem. IV)

Course Code: CHE- 252-MJM **Course Title:**Inorganic Chemistry -II

NEP 1.0 (2023 Pattern)

Time : 1.00 Hours **(No. of Credit 02)** **Max.Marks : 30**

Instruction to students:

1. All questions are compulsory and carry equal marks.
2. Figures to the right indicate full marks.
3. Neat and labeled diagram must draw wherever necessary.

Q.1. A) Attempt <u>each</u> of the following **(4Marks)**

a) Define ligand.
b) What is roasting?
c) Define back-bonding.
d) What is oxidation state of Pt. in $[Pt(NH_3)_2Cl_2]$?

B) Answer <u>each</u> of the following **(6 Marks)**

a) What is ore? Give any two names of ore.
b) Name the following complexes according to IUPAC system
   a) $K_4[Fe(CN)_6]$ b) $[Al(H_2O)_6]^{3+}$
c) Give the name of any two negative ligands.

Q.2 Attempt <u>any four</u> of the following **(12 Marks)**

a) Distinguish between double salt and complex salt.
b) Explain the term stepwise formation constant with suitable example.
c) Write a note on hydrate isomerism.
d) Explain the term Calcination with suitable example.
e) Give the synthesis of metal carbonyls by direct reaction method.
f) State whether EAN rule is obeyed in $Fe(CO)_5$(Atomic No. Fe =26)

Q.3 Answer <u>any two</u> of the following **(8 Marks)**

a) What is concentration of ore? explain the process of concentration by magnetic separation method.
b) Explain the factors affecting the stability of complex ions.
c) Give the postulates of Werner's theory.
d) Write a note on electrolytic refining.

[Total No. of Questions: 3] Seat No-

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S.Y.B.Sc

CHEMISTRY

SEMESTER-IV

CHE-253-MJM: Organic Chemistry-II

(2023 NEP Pattern)

Time: 1.00 hr.) **(No. of credits=02)** **(Max. Marks: 30**

Instructions to candidates:

I. *All questions are compulsory.*
II. *Figures on the right indicate full marks.*
III. *Neat diagrams must be drawn wherever necessary.*

Q.1 (A) Attempt **each** of the following [4]

i) Why thiophene is aromatic.
ii) What are biomolecules?
iii) Write the structure of - piperidine
iv) Define ketones.

(B) Attempt **each** of the following [6]

i) Write the structures of – 1. Alanine 2. Serine
ii) Why pyridine is basic?
iii) Give the IUPAC names of- 1. CH_3-$CHBr$-CH_2-CHO 2. CH_3-CH_2-CO-CH_2-CH_3

Q.2 Attempt **any four** of the following [12]

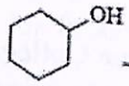
i) Define aldehydes. How aldehyde is obtained from toluene?
ii) Write a note on Cannizzaro's reaction.
iii) Explain the bromination reaction of benzene.
iv) Write the synthesis of anthracene.
v) Describe the nitration and reduction reactions of thiophene.
vi) Explain the acylation reaction glucose.

Q.3 Attempt **any two** of the following [8]

i) Explain the structural levels of protein architecture.
ii) Draw the structures of- 1. Lactose 2. Cellobiose
iii) Explain nitrous acid and Edmann reaction -NH_2 group of α-amino acid.

PTO

iv) Predict the product A & B of the following reactions-

1. 

$\xrightarrow[\text{dil. } H_2SO_4]{K_2Cr_2O_7}$ A $\xrightarrow{NH_2\text{-}NH_2}$ B

2. 
$\xrightarrow[AlCl_3]{CH_3\text{-}CO\text{-}Cl}$ A $\xrightarrow[HCl]{Zn\text{-}Hg}$ B

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[Total No. of Questions: 3]

Seat No-

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S.Y.B.Sc

CHEMISTRY

SEMESTER-IV

CHE-261-MN: Basic Concepts of Chemistry-II

(2023 NEP Pattern)

Time: 1.00 hr.) **(No. of credits=02)** **(Max. Marks: 30**

Instructions to candidates:

I. *All questions are compulsory.*
II. *Figures on the right indicate full marks.*
III. *Neat diagrams must be drawn wherever necessary.*

Q.1 (A) Attempt **each** of the following [4]

i) Define the term Normality.
ii) What is Standardization?
iii) Write the structure of – phenol.
iv) Define Hydrogen Bonding.

(B) Attempt **each** of the following [6]

i) What is wave Particle duality?
ii) Define the term: 1) Molarity 2) Molality.
iii) What are Resonance and Inductive Effect.

Q.2 Attempt **any four** of the following [12]

i) What are the assumptions of Bohrs theory?
ii) Write a note on Strength of acidity and basicity depends on inductive and resonance effect.
iii) Explain Photoelectric effect.
iv) Calculate the oxidation state of following compound
1) $KMnO_4$ 2) $MnSO_4$ 3) MnO_2
v) Describe the oxidation and Reduction with suitable reaction .
vi) Calculate the Wave number, Wavelength and frequency of the first line in the Lyman series.

Q.3 Attempt **any two** of the following

i) Explain Heisenberg Uncertainty Principle. [8]

ii) Calculate the radius of the K shell of Hydrogen atom.
[Given: $h = 6.62 \times 10^{-27}$ erg s , $m = 9.11 \times 10^{-28}$ g , $e = 4.80 \times 10^{-10}$ e.s.u]

iii) Explain the rules for calculating the Oxidation Number.

iv) Balance the following reaction by ion electron method.

$Mn^{2+} + S_2O_8^{2-} \longrightarrow MnO_4^- + HSO_4^-$

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Seat No- [ ]

[Total No. of Questions: 5]

[Total No. of pages: 2]

Anekant Education Society's

Tuljaram Chaturchand Arts, Science and Commerce College, Baramati,

(Empowered Autonomous)

Affiliated to Savitribai Phule Pune University, Pune

S.Y.B.Sc

SEMESTER-IV

CHEMISTRY

USCH-242: Organic and Inorganic Chemistry-II

(2022 Pattern)

Time: 2.00 hr.) **(No. of credits=03)** **(Max. Marks: 60**

Instructions to candidates:

I. All questions are compulsory.

II. Figures on the right indicate full marks.

III. Neat diagrams must be drawn wherever necessary.

Q.1 A) Answer **each** of the following [4]

i) State Huckel's rule.

ii) Define aldehyde

iii) What is coordination chemistry?

iv) Give the 4 examples of Bidentate ligand.

B) Answer **each** of the following [8]

i) Write the structures of- 1. Alanine 2. Glycine

ii) Draw the structure of Maltose.

iii) Define structural isomerism.

iv) What is Denticity?

Q.2 Answer **any three** of the following [12]

i) Write a note on Cannizarro's reaction.

ii) Explain the nitration and sulphonation reaction of pyrrole

iii) Write a note on Primary Valency and Secondary valency.

iv) Explain all the four types of Isomerism with suitable example

Q.3 Answer **any two** of the following [12]

i) Draw the cyclic structure of glucose. Explain the Ruff degradation reaction.

ii) Explain halogenation, nitration and sulphonation reactions of benzene.

iii) Give the classification of ketones. How acetone is obtained from-

1. iso-propyl alcohol 2. Methyl cyanide

PTO

Q.4 Answer **any two** of the following

i) Name the following compounds according to IUPAC nomenclature. [12]

1) $[Cr_2(Cl)_6]$ 2. $K_4[Ni(CN)_4]$ 3. $K_3[Fe\ CN)_6]$

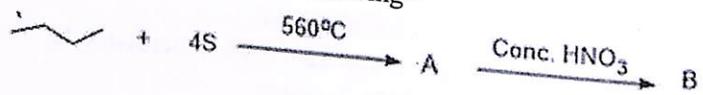
ii) What is Bidentate ligand? Explain the type of ligands.

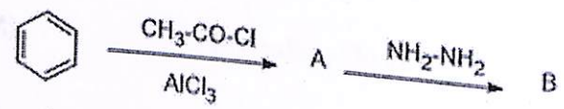
iii) State and explain 18 electron rule and EAN rule with their suitable example.

Q.5 Answer **any one** of the following

i) a) Explain structural levels of protein architecture. [12]

b) Predict the product A and B of the following-

1. 

2. 

ii) Explain the stability of metal carbonyls of first transition series with energy level diagram

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Seat No:-

[Total No. of Questions: 5]

[Total No. of pages: 2]

Anekant Education Society's

Tuljaram Chaturchand Arts, Science and Commerce College, Baramati,
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Affiliated to Savitribai Phule Pune University, Pune
S.Y.B.Sc.

Paper: - CHEM-2301 (Physical and Analytical Chemistry-I)
Semester- (III) Examination (2019 Pattern)
(No of Credits 03)

Max. Marks: 60

Time: 2.00 Hours

Indications to the candidates:

1) *All questions are compulsory and carry equal marks.*
2) *Figures to the right indicates full marks*
3) *Neat diagram must be drawn wherever necessary.*
4) *Use of calculator /logarithmic table is allowed.*

Q.1) A) Attempt each of the following. **(1 Mark each)**

i) Write the equilibrium constant expression of the reaction,
$CH_{4(g)} + H_2O_{(g)} \rightleftarrows CO_{(g)} + 3\ H_{2(g)}$
ii) Give any one statement of second law of thermodynamics.
iii) Define - Sampling
iv) Define – Quantitative analysis.

B) Attempt each of the following. **[2 Mark each]**

i) Calculate the order of reaction having rate law as, Rate = $k\ [A]^{3/2}\ [B]^{1/2}\ [C]^{1}$
ii) What is the difference between weight and mass?
iii) Write the mathematical expression of first order rate constant? What is its unit?
iv) What is volumetric analysis? Give its types.

Q.2) Attempt any three of the following. **[4 Mark each]**

i) Give the difference between Order and Molecularity of chemical reaction.
ii) Calculate the half-life period for first order reaction having $K_1 = 3.2 \times 10^{-3}\ s^{-1}$

(P.T.O)

iii) Find the number of moles of the indicated species in –

a) 4.93 gm, B_2O_3 b) 8.75 gm of Mn_3O_4

Given- Molar masses for, (a) $B_2O_3 = 69.61$ g/mol (b) $Mn_3O_4 = 228.81$ g/mol

iv) What factors are affecting choice of method in chemical analysis?

Q.3) Attempt any two of the following **[6 Marks each)**

i) Derive the relation between equilibrium constants, K_P and K_c. Explain the significances of each term in it.

ii) Explain the effect of different factors on the rate of chemical reaction.

iii) Calculate the activation energy of a reaction whose reaction rate at 27 ° C gets doubled For 10° C rise in temperature ($R = 8.314$ J K^{-1} mol^{-1})

Q.4) Attempt any two of the following. **[6 Marks each)**

1) Write a note on instrumental methods of analysis.
2) How 0.1 N iodine solution is made? How iodine solution is standardardized?
3) Explain the estimation of available chlorine in bleaching power..

Q.5) Attempt any one of the following **[12 Marks each)**

1) What do you mean by entropy? Explain its physical significances in detail. Derive an expression for entropy change for an ideal gas
2) What is indicator? What are the suitable and best indicator for the titration of a Strong acid and Strong base?
   In titration of 25 ml 0.1 N HCl with 0.1N NaOH calculate the pH-
   (1) At the start of the titration,
   (2) After 5 ml 0.1N NaOH to 25 ml 0.1 N HCl ,
   (3) At the equivalence point.

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[Total No. of Questions: 3]

Seat No-

[Total No. of pages: 2]

Anekant Education Society's

Tuljaram Chaturchand Arts, Science and Commerce College, Baramati,

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Affiliated to Savitribai Phule Pune University, Pune

S.Y.B.Sc

SEMESTER-III

CHEMISTRY

CHEM-2302: Organic and Inorganic Chemistry

(2019 Pattern)

Time: 2.00 hr.) **(No. of credits=03)** **(Max. Marks: 60**

Instructions to candidates:

i. *All questions are compulsory.*
ii. *Figures on the right indicate full marks.*
iii. *Neat diagrams must be drawn wherever necessary.*

Q.1)A) Attempt **each** of the following [4]

i) Define electrophile.
ii) What do you mean by dihedral angle?
iii) What is bond order?
iv) What is aprotic solvent?

B) Attempt **each** of the following [8]

i) Draw the structures of trans-1,3-dimethyl cyclohexane.
ii) State Hoffman's rule.
iii) What is Lewis Acid?
iv) Write the electronic configuration of Cr and Cu^{2+}.

Q.2) Attempt **any three** of the following [12]

i) Discuss the Saytzeff's elimination with suitable example.
ii) Explain the factors affecting the stability of conformation.
iii) Comment on the Electronegativity and Oxidation State of d block element.
iv) Explain Lux-Flood theory of acids and bases with suitable example.

Q.3) Attempt **any two** of the following [12]

i) How aniline is obtained from- 1. Chloro benzene 2. Nitro benzene
ii) Explain with Newman projection formula the stability of chair and boat

PTO

conformations of cyclohexane.

iii) Explain the mechanism of S_N2 reaction with energy profile diagram.

Q.4) Attempt **any two** of the following [12]

i) Draw the MO energy level diagram for He_2 molecule and calculate bond order.

ii) What are transition elements? Explain the following properties for first row transition elements- 1. Magnetic properties 2. Atomic size

iii) Explain Arrhenius concept of acids and bases with suitable example.

Q.5) Attempt **any one** of the following [12]

i) Answer the following-

1. Distinguish between the primary, secondary and tertiary amines with nitrous acid.
2. Describe the mechanism of addition of HBr to propene.

ii) Draw the MO energy level diagram for N_2 and HCl molecule and calculate their bond order and comment their stability.

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Seat No. [ ]

[Total No. of Questions:-5] [Total No. of pages:-2]

Anekant Education Society's

Tuljaram Chaturchand Arts, Science and Commerce College, Baramati,

(Empowered Autonomous)

S.Y.BSc. Semester-(IV),

Paper:- CHEM-2401 Physical And Analytical Chemistry-II

(2019 Pattern)

[Time-2.00 Hours] **[No. of Credits :03]** **[Max. Marks:-60]**

Indications to the candidates:

1. All questions are compulsory and carry equal marks.
2. Figures to the right indicates full marks
3. Neat diagram must be drawn wherever necessary.
4. Useof calculator /logarithmic table is allowed.

Q.1) A) Attempt each of the following. **(1 Mark each)**

i. What are the random errors?

ii. Define-the term retardation factor in chromatography.

iii. Define – Degree of dissociation.

iv. Give mathematical expression for Raoult's law for ideal solution.

B) Attempt each of the following. **(2 Marks each)**

i. Can you eliminate errors completely? Justify your answer

ii. Determine the number of significant figure in the following measured quantities.

a) 5000 b) 2.5×10^{-2} c) 3.69×10^{3} d) 0.0320 m^2

iii. What do you mean by partially miscible liquid system? Give two examples of it.

iv. What is mathematical expression for Gibb's phase rule. Explain the terms in it.

Q.2) Attempt any three of the following. **[4 Mark each]**

i. Explain the principle and technique of thin layer chromatography (TLC) .Discuss the various steps involved in TLC

ii. Why is CO2 used as mobile phase for super critical chromatography (SFC)?

iii. State the Nernst distribution law. Explain its applications.

iv. The solubility of CuBr is 2.0×10^{-4} mol / m 3 at 298 K. Calculate the solubility product Ksp, of CuBr.

P.T.O.

Q.3) Attempt any two of the following **[6 Marks each)**

i. What do you mean by Ionic product of water? Show that its value is 1.0×10^{-14}
ii. What do you mean by solubility and solubility product of sparingly soluble salt. Explain the applications of solubility product.
iii. Calculate the hydrolysis constant K_h, degree of hydrolysis h, and pH of 0.20 M solution of ammonium chloride if dissociation constant of ammonium hydroxide is 1.75×10^{-5}.

Q.4) Attempt any two of the following. **[6 Marks each)**

i. Calculate the absolute error and relative error in pph and ppt when the titration observations are 24.2, 24.3, 24.1, 23.9, and 23.8 ml..The true value of this titration is 24.0 ml
ii. Sketch the schematic diagram of Glass electrode. Describe its working. What are the advantages and disadvantages of glass electrode?
iii. What is principle of HPLC? List the main advantages of HPLC.

Q.5) Attempt any one of the following **[12 Marks each)**

i. What do you mean by Azeotropes or Azeotropic mixtures? Draw the T-X diagrams of the non-ideal solutions with minimum boiling point (type II) and maximum boiling point (type III). Give examples of azeotropes.
ii. What is chromatography? Classify the different types of chromatography describing the stationary and mobile phase used. Compare the technique of chromatography with that of solvent extraction. What are the advantages and disadvantages of chromatography?

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[Total No. of Questions:5] Exam Seat No- [ ]

[Total No. of pages: 2]

Anekant Education Society's

Tuljaram Chaturchand Arts, Science and Commerce College, Baramati,

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Affiliated to Savitribai Phule Pune University, Pune

S.Y.B.Sc.

Semester-IV

Chemistry

CHEM-2402 Organic and Inorganic Chemistry-II

(2019 Pattern)

Time:2.00 hr **(No. of credits=03)** **Max. Marks: 60**

Instructions to candidates:

1. *All questions are compulsory.*
2. *Figures in the right indicates full marks*
3. *Neat diagrams must be drawn wherever necessary*

Q 1)A) Attempt **each** of the following [04]

a) Which reagent is used to convert acetyldehyde to ethane ?

b) Draw the structure of glycine.

c) What is ligand?

d) Define Isomerism.

B) Attempt **each** of the following [08]

a) Draw the structure of sucrose.

b) What is Huckel's rule?

c) Why furan is aromatic?

d) What is coordination chemistry?

Q 2) Attempt any **Three** of the following [12]

a) What is the action of the following on pyridine?

1) KNO_3 / H_2SO_4 H_2/ Pt at 25°C

b) What is Perkin reaction? Explain with suitable example.

c) What are the assumptions of Werner theory?

d) Explain the method of synthesis of metal carbonyls.

Q 3) Attempt any **Two** of the following [12]

a) Explain Killani-Fischer synthesis of carbohydrate with suitable example.

b) What are heterocyclic compounds? Explain the synthesis of quinoline

c) Discuss the synthesis of primary, secondary and tertiary alcohol from Grignard reagent

Q.4) Attempt any **Two** of the following [12]

a) State and explain EAN rule with their suitable example

b) Name the following compounds according to IUPAC nomenclature.

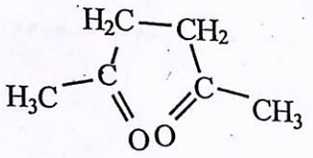
1. $[Fe(CO)_6]$ 2. $K_4[Ni(CN)_4]$ 3. $[Co(en)_3]Cl_3$

c) Draw the catalytic cycle for Wacker process with suitable reaction and mechanism.

Q 5) Attempt any **One** of the following [12]

a) What are carbohydrates? How will you synthesize Arabinose from Glucose? Draw the structure of α-D-Glucopyranose. Assign A & B of the following reaction

1. $H_3C-\overset{H_2}{C}-\overset{H_2}{C}-OH \xrightarrow{PCC} A \xrightarrow{H_2/\,Pt} B$

2. 

$\xrightarrow{P_2O_5} A \xrightarrow{H_2/\,Pt} B$

3. 
$\xrightarrow[AlCl_3]{CH_3\text{-}CO\text{-}Cl} A \xrightarrow{NH_2\text{-}NH_2} B$

OR

b) With the help of energy diagram of 3d, 4s and 4p orbitals, explain the stability of metal carbonyls of first transition series.

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Total No. of Questions :3 **Seat No.** [ ]

Total No. of pages: 03

Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati

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Affiliated to Savitribai Phule Pune University, Pune

S.Y. B. Sc. (Semester-III)

STATISTICS

STA-201-MJM: Continuous Probability Distribution-I

(2023 Pattern)

Time Allowed: 1 hour **No. of Credit:02** **Max Marks: 30**

Instructions:

i) **All questions are compulsory.**
ii) Figures to the right indicate full marks.
iii) Use of a scientific **calculator** and **statistical tables** is **allowed.**
iv) Symbols and abbreviations have their usual meanings.

Q 1) Attempt **each** of the following:

a) Choose the correct alternative in each of the following: **[1 each]**

i) Which of the followings is true for U(a, b) distribution?

(A) Mean = Mode = $\frac{a+b}{2}$ (B) Mean = Median = $\frac{a+b}{2}$

(C) Mean = Median = $\frac{1}{2}$ (D) Mean = Mode = $2(a+b)$

ii) Let X and Y be independent random variables with marginal p.d.f.s, $f_1(x)$ and $f_2(y)$ respectively. Then the conditional probability distribution of X given Y= y is

(A) $f_1(x)$ (B) $f_2(y)$

(C) $f_1(x)f_2(y)$ (D) $\frac{f_1(x)}{f_2(y)}$

iii) The points of inflexion of probability curve of $N(\mu, \sigma^2)$ distribution are

(A) $(\mu - \sigma^2, \mu + \sigma^2)$ (B) $(\mu - 2\sigma^2, \mu + 2\sigma^2)$

(C) $(\mu - \sigma, \mu + \sigma)$ (D) $(\mu - 3\sigma, \mu + 3\sigma)$

iv) Which of the following is **not** an example of a continuous random variable?

(A) Weight of a person.
(B) Daily rainfall in cm. at a particular place.
(C) Life in hours of an electrical component.
(D) No of accidents occurred on a highway.

P. T. O

b) Attempt **each** of the following: **[2 each]**

i) State whether each of the following statements is true or false.

1) For $N(\mu, \sigma^2)$ distribution, all cumulants K_r, $r \geq 3$ are equal to zero.

2) If F(x) is the distribution function of a continuous random variable X and $x_2 < x_1$ then $F(x_1) \leq F(x_2)$.

ii) If $X \sim U(a, b)$ distribution, E(X) = 1 and Var(X) = 3, find the values of a and b.

iii) Let X be a continuous r.v. with m.g.f. Mx(t). If $Y = a + bX$ $b \neq 0$, then show that m.g.f. of Y is $e^{at}Mx(bt)$.

Q 2) Attempt **any four** of the following:

a) Verify whether the following function is the probability density function (p.d.f.) of a random variable X. **[3 each]**

$$f(x) = \begin{cases} x & , 0 \leq x \leq 1 \\ 2 - x & , 1 \leq x \leq 2 \\ 0 & , \text{otherwise} \end{cases}$$

b) If X follows $U(-b, b)$ distribution, find the value of b such that $P(|X| < 1) = \frac{1}{7}$.

c) A continuous random variable X has p.d.f.,

$$f(x) = \frac{1}{2\sqrt{2\pi}} e^{-\frac{1}{8}(x-4)^2} \quad , -\infty < x < \infty.$$

i) Identify the probability distribution of X.

ii) Find $P(|X + 3| \leq 1)$.

d) Define the following:

i) Independence of random variables X and Y.

ii) The r^{th} raw moment of a continuous random variable X.

iii) Mode of a continuous random variable X.

e) It is known that 30% of individuals in a locality are graduates. Using normal approximation find the probability that in a sample of 1500 number of graduates lies between 420 and 550.

f) The joint p.d.f. of a bivariate continuous random variable (X, Y) is

$$f(x, y) = k \; ; \; x > 0, y > 0, \; x + y < 2.$$
$$= 0 \; ; \text{otherwise.}$$

Find the value of constant k. Also find the marginal pdf of X.

[4 each]

Q 3) Attempt **any two** of the following:

a) Let a bivariate continuous random variable (X, Y) has joint p.d.f.,

$$f(x, y) = 4xy \quad ; \quad 0 < x < 1, \ 0 < y < 1$$

$$= 0 \quad ; \quad \text{otherwise.}$$

i) Show that X and Y are independent

ii) Find E(X) and E(Y). Hence find E(XY).

b) If $X_1, X_2, \ldots, X_n$ is a random sample from $N(\mu, \sigma^2)$ distribution then obtain the probability distribution of $(X_1 + X_2 + \ldots + X_n)$. Hence state the probability distribution of sample mean $\overline{X}$.

c) A random variable X has p.d.f.,

$$f(x) = 3(1- x)^2 \quad ; \quad 0 < x < 1,$$

$$= 0 \quad ; \quad \text{otherwise.}$$

Find the probability distribution of $Y = -\log(1 - X)$.

d) The joint p.d.f. of random variable (X, Y) is,

$$f(x, y) = 4x(1-y) \quad ; \quad 0 < x < 1, \ 0 < y < 1$$

$$= 0 \quad ; \quad \text{otherwise.}$$

Find: i) The marginal p.d.f. of X.

ii) The conditional p.d.f. of Y given $X = x$.

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Total No. of Questions: 03] Seat No. [ ]

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Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati

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Affiliated to Savitribai Phule Pune University, Pune

S.Y.B.Sc.

STATISTICS

STA-202-MJM : STATISTICAL TECHNIQUES – I

(2023 Pattern)

Time:1 hour] (2 Credits) [Max. Marks:30

N.B. 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of statistical tables and calculator is allowed.

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Q1 Attempt *each* of the following:

A) In each of the following cases, choose the correct alternative: (1 each)

i) If $(X_1, X_2, X_3, X_4) \rightarrow MD(20, \frac{1}{2}, \frac{1}{8}, \frac{2}{8}, \frac{1}{8})$ then X_3 follows

a) $B(20, \frac{3}{8})$ b) $B(20, \frac{6}{8})$ c) $B(20, \frac{4}{8})$ d) $B(20, \frac{2}{8})$

ii) If X follows Negative Binomial distribution then
a) Mean > Variance b) Mean < Variance
c) Mean = Variance d) Mean = 2Variance

iii) The difference between Gross National Product (GNP) and Net National Income (NNP) is
a) Indirect taxes b) Depreciation
c) Net factor Income from abroad. d) Total consumption

iv) Let $X \rightarrow N(5, 16)$. If $P(|X - \mu| < k\sigma) \geq \frac{24}{25}$ then the value of k is .

a) 5 b) 1/5 c) 1/25 d) 25

B) Answer the following: (2 each)

i) a) 'Number of persons to be interviewed for a post until a suitable candidate is found 'This is counter example of negative binomial distribution.

b) If X_T is truncated binomial r. v. then the sum of probabilities that X_T takes is not equal to 1. (PTO)

ii) If $X \rightarrow NB(K, p)$ such that, $E(X) = 20$, $Var(X) = 120$ then find the values of parameters K and p.

iii) Write variance-covariance matrix of multinomial distribution.

Q2 Attempt any ***four*** of the following: (12)

i) Let $X \rightarrow Exp(\Theta = 1)$. Find the upper bound of $P(|X - \mu| \geq 6)$ given by Chebyshev's inequality.

ii) Write the different concepts of National Income.

iii) Show that under certain conditions negative binomial distribution is tends to Poisson distribution. Is additive property holds for geometric distribution?

iv) If $(X_1, X_2, X_3, X_4, X_5)$ is a trinomial r. v. with parameters $(n, p_1, p_2, p_3, p_4, p_5)$ then find the probability distribution of $\underline{U} = (X_1+X_2, X_3, X_4, X_5)$.

v) Define Truncated Poisson distribution left to X= 0. Also find its mean and state its relationship with mean of Poisson distribution

vi) State and prove additive property for negative binomial distribution. Comment on 'Is additive property holds for geometric distribution?'

Q3 Attempt any ***two*** of the following: (8)

a) If $(X_1, X_2, ..., X_k) \rightarrow MD(n, p_1, ..., p_k)$ then find the conditional distribution of X_i given X_j.

b) Define negative binomial distribution and find its mean.

c) Chebyshev's inequality for discrete. If $X \sim B(n = 100, p = 0.3)$ then determine the upper bond regarding probability of X residing between 20 and 40 using Chebyshev's inequality.

d) Describe the income method for estimation of National Income.

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No. of Questions: 03 Seat No.

[Total No. of pages: 02

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
(Autonomous)
Affiliated to Savitribai Phule Pune University, Pune
S.Y.B.Sc. (Sem-III)
Statistics
Semester-III
STA-203- MJM - Applied Statistics-I
(2023 Pattern)

Time Allowed: 1 Hours **No. of credits: 02** **Max Marks: 30**

Instructions:

i) **All questions are compulsory.**
ii) **Figures to the right indicate full marks.**
iii) **Use of calculator and statistical tables is allowed.**
iv) **Symbols and abbreviations have their usual meanings.**

Q.1) Attempt each of the following

A) Choose the correct alternative of the following: **[1 each]**

i) Laspayre's price index number uses weight as:
   a) Base year quantity
   b) Current year quantity
   c) Arithmetic mean of base year quantity and current year quantity.
   d) Geometric mean of base year quantity and current year quantity.

ii) The method of moving average is used in analyzing the:
   a) Seasonal trend
   b) Cyclical trend
   c) Irregular trend
   d) Secular trend

iii) Econometrics means
   a) measurement of economics
   b) statistical model
   c) mathematical model
   d) All of above.

iv) Customer behavior in which the customer moves from one the queue to another in a multiple channel situation:
   a) Balking
   b) Jockeying
   c) Alternating
   d) reneging

B) Attempt any three of the following: **[2 each]**

i) Give formula for Laspeyre's Index Number and Paasche's Index Number.
ii) Define Econometrics.
iii) State two merits of Least square method.

P. T. O

Q.2) Attempt <u>any four</u> the following **[3 each]**

i) Explain Seasonal Variation as a component of time series.

ii) Make a critical comparison between **Laspayre's** and Paasche's Index Numbers.

iii) Discuss four major components of time series with the help of an example.

iv) Explain Applied and Theoretical econometrics.

v) Explain the following terms:
   a) Queuing system
   b) Service Channel

vi) Discuss the various problems involved in the construction of index numbers.

vii) Explain Objectives of econometrics.

Q.3) Attempt <u>any two</u> the following **[4 each]**

i) With usual notations show that P_{01}^{F} (Fisher's price index number) Lies between P_{01}^{p} (Paasche's price index number) and P_{01}^{L} (Laspeyre's price index number).

ii) A road transport company has one reservation clerk on duty at a time. He handles information of bus schedules and make reservations. Customers arrive at a rate of 8 per hour and the clerk can service 12 customers on an average per hour. Under assumption of queuing theory, find :
   a) Average number of customers waiting for the service.
   b) Average number of customers in a queue.
   c) Average waiting time of customer for the service.

iii) Describe the method of Ratio to Moving average for the estimation of seasonal indices and discuss its demerits.

iv) Define splicing, deflating and real Income.

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Total No. of Questions: 03]

Seat No. [ ]

[Total No. of pages: 02

Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati.

(Autonomous)

Affiliated to Savitribai Phule Pune University, Pune.

S.Y.B.Sc. (Semester III)

Statistics STA-211-MN : Foundations of Probability: Theory and Applications

(2023 Pattern)

No. of credits: 02

Time Allowed: 1.00 hrs.] **[Max Marks: 30**

Instructions:

i) All questions are compulsory.
ii) Use of scientific calculator and statistical table is allowed.
iii) Symbols and abbreviations have their usual meaning.

Q.1) A) Choose the correct alternative of the following: **(1 each)**

i) In an experiment of planting five seeds, the number of seeds germinated after a week are recorded. The Sample space of this experiment is

a) $(0,5)$ b) $\{1,2,3,4,5\}$ c) $[0\ 5]$ d) $\{0,1,2,3,4,5\}$

ii) If $P(A \cap B)=0$ then the two events A and B are

a) Mutually exclusive b) Exhaustive events

c) Independent events d) Dependent events

iii) If X follows discrete uniform distribution on 0,1,…,n and the mean of the distribution is 6 then the value of n is

a) 6 b) 18

b) 36 d) 12

iv) A probability lies between

a) 0 to 1 b) $-\infty$ to ∞ c) 0 to ∞ d) $-\infty$ to 0

(2 each)

B) Answer each of the following:

i) Define Classical definition of probability.

ii) State Bayes' theorem.

iii) Determine k such that the following function is p.m.f.

$P(x) = kx$; x=1,2,3,--------,10.

P. T. O

Q.2) Attempt any four of the following: **(3 each)**

i) Define with example each of the following
a) Random Variable b) Discrete sample space c) Event

ii) In a random arrangement of the letters of the word "STATISTICS", find the probability of, all vowels occupy even.

iii) A random variable X assumes 7 values –3, -2, -1, 0, 1, 2, 3 with equal probability, find E(X) and $E(X^2)$.

iv) Define Binomial distribution. State mean and variance of binomial distribution.

v) Two cards are drawn from a well shuffled pack of playing cards. Find the probability That both cards are of diamond.

vi) For events A and B if P(A) = P (A/B) = 0.15 and P (B/A) = 0.20 , then check whether A and B are independent

Q.3) Attempt any two of the following: **(4 each)**

i) Number of hardware failures (X) of a computer system in a week of operation has the following p.m.f.

X	0	1	2	3	4	5	6
P(x)	0.18	0.28	0.25	0.18	0.06	0.04	0.01

Find E(X) and V(X).

ii) Suppose X ~ B(n, p) if E (X) = 6 & Var(X) = 4.2 find n and p. Also compute P(X=2)

iii) Define cumulative distribution function (c.d.f.) of a discrete random variable and state its important properties.

iv) Bag I contains 6 blue and 4 red balls. Bag II contains 2 blue and 6 red balls. Bag III Contains 1 blue and 8 red balls. A bag is chosen at random; a ball is drawn randomly from this bag. It turns out to be blue. Find the probability that bag I was chosen.

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Total No. of Questions: 03 Seat No. [ ]

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Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
(Autonomous)
Affiliated to Savitribai Phule Pune University, Pune
S. Y. B. Sc. (Sem-III)
Statistics
Semester-III
STA-221-VSC : Quantitative Techniques
(2023 Pattern)

Time Allowed: 1 Hours **No. of credits: 02** **Max Marks: 30**

Instructions:

i) **All questions are compulsory.**
ii) **Figures to the right indicate full marks.**
iii) **Use of calculator and statistical tables is allowed.**
iv) **Symbols and abbreviations have their usual meanings.**

Q. 1) A) Choose the correct alternative of the following: **(1 each)**

i) The set of all possible solutions that satisfy all the constraints of an LPP is called:

A] Feasible region B] Objective function C] convex set D] Optimal solution.

ii) If the primal problem is feasible and has a finite optimal solution, then the dual Problem

A] Has no solution B] Must also be feasible and have a finite optimal solution
C] Is infeasible D] Always has an infinite solution.

iii) The Transportation problem can be classified as a:

A] Non- Linear programming problem B] Integer programming problem
C] Linear programming problem D] none of the above.

iv) In an assignment problem, the number of assignments is equal to

A] Number of rows B] Number of columns
C] The difference between rows and columns D] The minimum of rows and columns.

B) Define the following terms: **(2 each)**

i) Surplus variable
ii) Degenerate solution in LPP.
iii) Unbalanced Transportation problem

Q. 2) Attempt any four of the following. **(3 each)**

i) Draw an initial simplex table for the following LP problem.

$$Maximize\ Z = 7x_1 + 6x_2$$

$$Subject\ to$$

$$x_1 + x_2 \leq 4$$

$$2x_1 + x_2 \leq 6$$

$$and\ x_1,\ x_2 \geq 0$$

ii) Obtain Initial basic feasible solution to the give transportation problem using North-West corner method.

P. T. O

Destination→ / Origin↓	D_1	D_2	D_3	Supply
O_1	13	15	16	17
O_2	7	11	2	12
O_3	19	20	9	16
Demand	14	8	23	

iii) Solve the following game.

Player B

		B1	B2	B3
Player A	A1	-5	2	0
	A2	5	6	4
	A3	4	0	2

iv) Using graphical method, obtain feasible region for the following constraints.

$$3x_1 + x_2 = 3$$
$$x_1 + 2x_2 \leq 4$$
$$and\ x_1, x_2 \geq 0$$

v) Describe the algorithm for Hungarian method.

vi) Explain the term "Two-person zero sum game" and "Pay off"

Q. 3) Attempt any two of the following: **(4 each)**

i) Solve the following Assignment problem.

	I	II	III	IV
A	10	12	19	11
B	5	10	7	8
C	12	14	13	11
D	8	15	11	9

ii) Find the optimum solution for the transportation problem.

Origin \ Warehouses	W_1	W_2	W_3	Supply
O1	(5) 2	7	4	5
O2	3	(2) 3	(6) 1	8
O3	5	(7) 4	7	7
O4	(2) 1	6	(12) 2	14
Demand	7	9	18	

iii) Define Transportation Problem. State any two real life situations from business where transportation problem may be used

Total No. of Questions : 03] **Seat No.** [ ]

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Anekant Education Society's

TuljaramChaturchand College of Arts, Science and Commerce, Baramati

(Empowered Autonomous)

S.Y.B.Sc.(Sem-IV) Statistics

STA-252-MJM: Statistical Techniques-II

(2023Pattern)

No. of Credits:2

Time Allowed: 1.00 Hr **Max Marks: 30**

Instructions:

i) All questions are compulsory.
ii) Figures to the right indicate full marks.
iii) Use of a scientific calculator and Statistical table is allowed.
iv) Symbols and abbreviations have their usual meanings.

Q.1) Attempt each of the following: **[1 each]**

a) In each of the following cases, *choose the correct alternative:*

i) Multiple correlation coefficient lies between .....

A] 0 to 1 B] $-\infty$ to ∞ C] 0 to ∞ D] -1 to 1

ii) A critical region is a region of

A] Rejection for H_0 B] Acceptance for H_0

B] Rejection for either H_0 or H_1 C] Acceptance for both H_0 and H_1

iii)The regression planes coincide if

A] $|R| = 0$ B] $|R| = 1$ C] $|R| > 0$ D] $|R| > 1$

iv)*If* $2X_3-11X_1+7X_2=160$ is the regression plane of X_3 on X_1 and X_2 then $b_{31.2}$ is

A]$\frac{-11}{2}$ B]$\frac{7}{2}$ C] $\frac{11}{2}$ D]$\frac{7}{2}$

[2each]

b) Attempt the following

i) In testing the significance of the difference between two proportions, the first sample gives 25 successes in 100 trials and the second sample of 50 gives 10 successes then finds pooled estimate of p.

ii) If $R_{1.23} = 0$ then show that $r_{12} = 0 and r_{13=0}$.

iii) If $\sigma_1^2 = 4, |R| = 8 \; and R_{11} = 20,$ then find $Var(X_{1.23})$

P.T.O.

Q.2) Attempt <u>any four</u> of the following: **[3each]**

a) Define p-value. How can one decide whether to accept or reject H_0 based on p-value in hypothesis testing? If the p-value is 0.1295 then what will be the decision regarding H_0 at 1% l.o.s?

b) In a trivariate data $r_{12} = 0.4, r_{13} = 0.5, r_{23}=0.8$. Check whether the given data is consistent.

c) Define: i) Critical Region ii) Null hypothesis iii) Level of Significance

d) Define residual $X_{1.23}$ of X_1 w.r.t. X_2 and X_3. Prove that $\bar{X}_{1.23} = 0$.

e) Give real-life situations where trivariate regression can be applied. If X_2 is the dependent variable and X_2, and X_3 are independent variables then write an equation for the plane of regression of X_2 on X_1 and X_2 according to Yule's notation.

f) What is multiple correlation? Interpret $R_{1.23}=1$.

Q.3) Attempt <u>any two</u> of the following:

a) If r_{12} and r_{13} are given show that r_{23} lie within the limits **[4each]**

$$r_{12}r_{13} \pm (1 - r^2_{12} - r^2_{13} + r^2_{12}r^2_{13})^{\frac{1}{2}}$$

b) Describe the test procedure for testing $H_0: \mu = \mu_0$ against $H_1: \mu \neq \mu_0$, where μ is the mean of the normal population with known variance σ^2.

c) Check whether gender and preference for a particular mode of transport are independent. The following data was collected through a survey:

Mode of Transport \ Gender	Male	Female
Car	40	30
Bus	60	90

d) A pharmaceutical company wants to test the effectiveness of a new drug in reducing blood pressure. They measure the systolic blood pressure (in mmHg) of 6 patients before and after taking the drug. The data is given below:

BP before taking the drug : 150, 145, 160, 155, 148, 152

BP after taking the drug : 140, 138, 150, 145, 142, 144

Test whether the drug significantly lowers blood pressure

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Total No. of Questions: 03] Exam Seat No. [ ]

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Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati.
(Autonomous)
Affiliated to Savitribai Phule Pune University, Pune
S.Y.B.Sc.
Statistics
Semester-IV
STA-253-MJM: Applied Statistics – II
(2023 Pattern)

Time Allowed: 1.00 hrs] **(No. of credits:02)** **[Max Marks: 30**

Instructions:
i) All questions are compulsory.
ii) Symbols and abbreviations have their usual meaning.

Q.1 A] Choose the correct alternative of the following: **(1 each)**

i) The control chart for process variability is the

A] $\overline{X}$-chart B] R-chart C] c-chart D] p-chart

ii) Quality is inversely proportional to --------

A] Cost B] time C] method D] variability

iii) Which of the following is not a Statistical Process Control (SPC) tool?

A] Histogram B] Control chart C] Regression Analysis D] Pareto Diagram

iv) What does the Cpk index measure in Statistical Process Control (SPC)?

A] Process variation

B] Process stability

C] Process capability to meet specifications

D] Process shifts

B] Answer the following: **(2 each)**

i) Define Defect and Defective with an example

ii) Explain why do we draw R chart before drawing $\bar{X}$ chart

iii) Give interpretation of high spot and low spot-on P-chart

Q.2 Attempt any four of the following: **(3 each)**

i) Samples of size 5 are taken from a manufacturing process at regular intervals. A normally distributed quality characteristic is measured and $\bar{X}$ and R are calculated

for each sample. After 20 samples, we have $\bar{\bar{X}} = 6.40$ and $\bar{R} = 0.0877$. Compute the center line and control limits for the $\bar{X}$ and R chart. (n=5, A_2=0.577, D_3=0, D_4=2.115)

ii) Write a note on cause-and-effect diagram.

iii) Define the Cp and Cpk indices. Interpret Cp < 1, Cp=Cpk

iv) Explain four criteria for detecting lack of control limits.

v) Give justification of 3-σ control limits for c-chart

vi) State eight dimensions of quality and explain any one of them.

Q.3 **Attempt <u>any two</u> of the following:** **(4 each)**

i) Define natural tolerance limit and specification limit. Also find probability of an item is defective.

ii) Explain the construction of p-chart when sample size is fixed and standards are not given.

iii) The specifications for a critical characteristic of an electric resistor call for it to have a resistance of 500 ± 25 ohms. The process for making the resistors produces a normal distribution of measurements of resistance with a standard deviation of 5 ohms.

(i) Calculate Cp for this situation

(ii) Is the process capable of performing the operation successfully?

iv) Explain the construction of R-chart when standards are not given.

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Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati.

(Autonomous)

Affiliated to Savitribai Phule Pune University, Pune.

S.Y.B.Sc. Minor (Semester IV)

Statistics

STA-261-MN : Probability Distributions and Applications

(2023 Pattern)

Time Allowed: 1.00 hrs.] **[Max Marks: 30**

Instructions:

i) All questions are compulsory.

ii) Use of scientific calculator and statistical table is allowed.

iii) Symbols and abbreviations have their usual meaning.

Q.1) A) Choose the correct alternative of the following: **(1 each)**

i) If X and Y are any two random variables then the cov(aX+b, cY+d) is

a) cov(X, Y) b) abcd cov(X, Y) c) ac cov (X, Y) d) ac cov(X, Y) +bd

ii) Karl Pearson's coefficient of correlation lies between

a) 0 to 1 b) -1 to 1 c) 0 to ∞ d) -∞ to ∞

iii) The mean of a Geometric distribution with parameter p is:

a) $\frac{1}{p}$ b) $\frac{p}{1-p}$ c) $\frac{1-p}{p}$ d) p

iv) Which measure is used to determine the "peakedness" of a distribution?

a) Skewness b) Kurtosis

c) Mean deviation d) Standard deviation

B) Answer each of the following: **(2 each)**

i) If $b_{yx} = -1.8$, $b_{xy} = -0.2$ and variance (X) = 4. Find the standard deviation of Y and covariance between X and Y.

ii) Explain positive and negative skewness with illustration.

iii) For a bivariate data x and y, the regression equations to two lines of regression are $3x - 2y + 1 = 0$ and $3x - 8y + 13 = 0$. Predict the value of y for x = 4 and value of x for y = 3.

Q.2) Attempt any four of the following: **(3 each)**

i) State the normal equation to fit a) $Y = ab^x$ b) $Y = a + bx + cx^2$

ii) A r.v. (X,Y) has joint p.m.f. as follows.

X \ Y	0	1	2
-1	0.1	0.2	0.3
1	0.1	0.1	0.2

Obtain a) marginal probability distributions of X and Y b) P(Y≤ 1)

P.T.O

iii) Define raw and central moment for grouped data. State $\mu 3$ in terms of raw moments.

iv) If $\bar{X} = 5$, $\bar{Y} = 3$ and $b_{yx} = 0.6$, obtain the regression estimate of Y for X = 3.

v) Define regression coefficients and state any two properties.

vi) Define Poisson distribution. State its mean and variance. Give one real life situation where Poisson distribution is applied.

Q.3) Attempt any <u>two</u> of the following:

i) Find the correlation coefficient between population density (x) and pollution (y) measured in suitable units for the following data. **(4 each)**

X	11	12	13	14	15
Y	0.50	0.52	0.60	0.68	0.80

Also interpret the result.

ii) Define kurtosis and explain different measures of Kurtosis.

iii) If the probability that a certain test yields a positive reaction is equal to 0.4, what is probability that less than 5 negative reaction occur before the first positive one?

iv) Determine the regression coefficients from the following data.

x	7	6	10	14	13
Y	22	18	20	26	24

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Anekant Education Society's

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati

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Affiliated to Savitribai Phule Pune University, Pune

S.Y.B.Sc.(Sem-IV) Statistics

USST242: Continuous Probability Distributions-II

(2022 Pattern)

Time Allowed: 2 Hrs **Max Marks: 60**

Instructions:

i) **All questions are compulsory.**
ii) Figures to the right indicate full marks.
iii) Use of a scientific **calculator** and **statistical tables** is **allowed.**
iv) Symbols and abbreviations have their usual meanings.

Q.1) Attempt <u>each</u> of the following:

a) In each of the following cases, choose the correct alternative: **[1 each]**

i) If X follows Chi-square distribution with 6 degrees of freedom then Mean of X is
A) 6 B) 12 C) 0 D) 3

ii) Let $t \sim t_{10}$. Then coefficient of kurtosis is
A) 1 B) 2 C) 4 D) 0

iii) What is the assumption made for performing the one sample t - test?
A) the distribution of random variable is non-symmetric
B) the distribution of random variable has more than one modal class
C) the distribution of random variable has a constant variance
D) the distribution of random variable follows a normal distribution

iv) If $X_1 \sim N(0,1)$, $X_2 \sim N(0,1/2)$ are independent then distribution of $x_1^2 + 2x_2^2$ is
A) χ_1^2 B) χ_2^2 C) χ_3^2 D) N(0,1)

b) Attempt <u>each</u> of the following **[2 each]**

i) In each of the following, state whether the given statement is true or false.
1) The test statistic of McNemar's test follows χ^2 distribution with 1 d.f.
2) F test is used for testing symmetry of 2 X 2 table.

ii) Identify the distribution of a r.v. X if its m.g.f. $M_X(t)=(1-2t)^{-16}$ where $t < \frac{1}{2}$.

iii) State the inter-relations among normal, Chi-square and t-distribution.

iv) State confidence interval for the difference between to two population proportion when population variances are known.

[P.T.O.]

Q.2) Attempt **any three** of the following:

a) Define the following: **[4 each]**

i) Null hypothesis
ii) Parameter
iii) Critical Region
iv) Level of significance

b) Describe Chi-square test for independence of two attributes arranged in 2 × 2 contingency table.

c) A sample of 65 glass rods is taken from a lot manufactured under a new process and tested for their breaking strength. The mean strength of the sample is found to be 47.8 lbs and the standard deviation 10 lbs. Test the claim that the average strength of the rod is at least 50 lbs. use 5% level of significance.

d) If X_1, X_2, X_3, X_4 are i.i.d. N(0,1) variates, find a such that

$$P\left(\frac{3X_4^2}{X_1^2+X_2^2+X_3^2} \leq a\right) = 0.01$$

Q.3) Attempt **any two** of the following:

a) Define Chi-Square distribution with n degrees of freedom and derive its probability density function. **[6 each]**

b) Describe test procedure for testing $H_0 : \sigma_1^2 = \sigma_2^2$ against $H_1 : \sigma_1^2 \neq \sigma_2^2$, where σ_1^2 and σ_2^2 are the variances of two normal populations. State the underlying assumptions.

c) Let $X_1, X_2, \ldots, X_{12}$ be independent normal variates such that $E(X_r)=0$ and $V(X_r)=r^2$ where r=1,2,…,12. Find $P\left(X_1^2 + \frac{X_2^2}{2^2} + \cdots + \frac{X_{12}^2}{12^2} \leq 11 \cdot 340\right)$.

Q.4) Attempt **any two** of the following:

a) Let X follows F with n_1 and n_2 degrees of freedom. Find the mode of X. **[6 each]**

b) If X and Y are independent Chi-square variate with m and n d.f. respectively, show that U=X+Y and $V=\frac{X}{X+Y}$ are independently distributed.

c) A manufacture of mixed nuts claims that each box of mixed nuts that he sells contains peanuts, cashews, peacans and butternuts in the proportion of 4:3:2:1. A sample consist of 88 peanuts, 61 cashews, 49 peacans and 52 butternuts. Test the manufacturer's claim using 5% level of significance.

Q.5) Attempt **any one** of the following:

a) i) Define t- distribution. If a random variable follows t distribution with n degrees of freedom, then show that the mean deviation about mean is $\sqrt{\frac{n}{\pi}}\frac{\left(\frac{n-1}{2}\right)}{\frac{n}{2}}$.

ii) Let $\bar{X}$ and S^2 be the mean and variance of a random sample of size 16 from a N(3,64) distribution. Evaluate P $(-1 < \bar{X} < 5, 34.188 < S^2 < 77.244)$.

[6+6]

b) i) A score obtained by 8 candidates before and after giving them training are as given below.

Score before training	35	42	38	49	52	29	37	24
Score after training	40	42	39	45	57	35	36	32

Test whether the training is effective. Use 5% level of significance.

ii) If X_1 and X_2 are i.i.d. N(0,1) variates find

$P((x_1 + x_2)^2 \leq 3.284, (x_1 - x_2)^2 \geq 2.148)$

[6+6]

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Total No. of Questions : 05] **Seat No.** [ ]

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Anekant Education Societys

Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati

(Empowered Autonomous)

S.Y.B.Sc.(Sem-IV) Statistics

STAT2401: Statistical Techniques- II

(2019 Pattern)

Credits:3

Time Allowed: 2.00 Hours **Max Marks: 60**

Instructions:

i) **All questions are compulsory.**
ii) Figures to the right indicate full marks.
iii) Use of a scientific **calculator** and **statistical tables** is **allowed**.
iv) Symbols and abbreviations have their usual meanings.

Q.1) Attempt <u>each</u> of the following:

a) In each of the following cases, choose the correct alternative: **[1 each]**

i) R-code for drawing a simple random sample of size 5 from a population of 50 units by SRSWR methods is

A) sample(50,5,replace=T) B) sample(50,5, replace=F)

C) sample(5,50, replace=F) D) sample(5,50,replace=T)

ii) Multiple Correlation coefficient lies between .....

A) 0 to 1 B) $-\infty$ to ∞ C) 0 to ∞ D) -1 to 1

iii) In M/M/1:∞/FIFO queuing model, the probability that the server is busy is

A) $\frac{\lambda}{\mu}$ B) $1-\frac{\lambda}{\mu}$ C) $\frac{\mu}{\lambda}$ D) $1-\frac{\mu}{\lambda}$

iv) Which of the following control chart is constructed for number of defects?

A) $\bar{X}$ B) R C) P D) C

P.T.O.

b) Attempt the following **[2 each]**

i) If X follows exponential distribution with mean 3.5 then write down R code to find
   a) P(X<7)
   b) P(4<X<7)

ii) In a trivariate data. $r_{12} = 0.5$, $r_{13} = -0.3$, $r_{23} = 0.6$. Are these values consistent?

iii) What are the control limits in X bar control chart when standard are given?

iv) Define Calling Population and Queue Length in queuing theory

Q.2) Attempt **any three** of the following: **[4 each]**

a) At a petrol pump customer arrives in a Poisson process with an average time of 5 minutes between arrivals. The time intervals between services at the petrol pump follow an exponential distribution and the mean time taken to service a vehicle is 3 minutes. Assuming that the queuing system fulfills the assumptions of M/M/1 queue find

   i) probability that the petrol pump is idle

   ii) expected queue length

b) The time in minutes taken to complete a job by machine A and machine B is given below:

   Machine A: 20, 14, 25, 24, 23, 22, 21

   Machine B: 20, 25, 35, 30, 30, 32, 34, 25, 37

   Write R code to test at 2% l.o.s. whether variability in time distribution of population A is less than that in population B?

c) With usual notations show that, $b_{12.3} = \frac{b_{12} - b_{13}b_{32}}{1 - b_{23}b_{32}}$

d) Explain the construction of C chart when standards are not specified.

Q.3) Attempt **any two** of the following: **[6 each]**

a) Describe the parameters in M/M/1:∞/FIFO queuing model.
   Also derive the expression for the average number of customers in a queue under the above model.

b) For 20 subgroups each of size 55 , $\sum \bar{X} = 19$ *and* $\sum R = 0.2$. Compute three sigma limits for $\bar{X}$ and R charts. Estimate the process standard deviation.

c) Explain the concept of partial regression.

If r_{12} and r_{13} are given show that r_{23} lie within the limits

$$r_{12}r_{13} \pm (1 - r^2{}_{12} - r^2{}_{13} + r^2{}_{12}r^2{}_{13})^{\frac{1}{2}}$$

Hence or otherwise show that, if r_{12}= k, r_{13}=-k then r_{23} lies between -1 and 1-2k^2.

[6 each]

Q.4) Attempt **any two** of the following:

a) For a trivariate data, σ_1= 1, σ_2 = 4, σ_3 = 9, r_{12} = 0.4, r_{13} = 0.5, r_{23} = 0.2. Find the values of $b_{12.3}$, $R_{1.23}$ and $r_{23.1}$.

b) Management has decided to set a standard of 3% for the proportion of non-confirming test tubes produced in a plant. Numbers of defectives from 20 samples of size 100 are given: 4, 2, 5, 3, 6, 4, 3, 9, 5, 6, 9, 3, 3, 4, 2, 5, 3, 1, 4, 3. Construct p chart. Comment.

c) Describe in brief the characteristics of a queuing model.

[12 each]

Q.5) Attempt **any one** of the following:

a) In a study of random sample of 50 students, the following results were obtained with respect to X_1, X_2 and X_3 where X_1 : Marks, X_2 : I.Q. and X_3 : Hours of study per week

With usual notations

$$R = \begin{pmatrix} 1 & 0.4 & 0.3 \\ & 1 & -0.2 \\ & & 1 \end{pmatrix}$$

$\bar{X}_1 = 70$, $\bar{X}_2 = 100$, $\bar{X}_3 = 18$, $\sigma_1 = 1, \sigma_2 = 2$ *and* $\sigma_3 = 4$ Determine the regression equation of plane of X_1 on X_2 and X_3 if the variables are measured from their respective means.

(i) Estimate value of X_1 for X_2 = 110 and X_3 = 20

(ii) Compute $R_{1.23}$

(iii) Compute $\sigma_{1.23}$

P.T.O.

b) Consider a process in which coils are manufactured. In 10 subgroups each of size 5 coils are randomly selected from the process and resistance value of each coil is measured. The data is given below:

Sample No.	Mean	Range
1	20.5	2
2	19.5	3
3	21.5	4
4	19.4	3
5	18.5	1
6	20.4	4
7	22.1	3
8	20.2	1
9	21.4	2
10	21.6	2

If the target value for average and standard deviation of the resistance of coils are 20 and 2 respectively, set up $\overline{X}$ and R chart. Comment on it.

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Total No. of Questions : 05] **Seat No.** [ ]

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Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati

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Affiliated to Savitribai Phule Pune University, Pune

S.Y.B.Sc.(Sem-IV) Statistics

STAT2402: Continuous Probability Distributions-II

(2019 Pattern)

Time Allowed: 2 Hrs **Max Marks: 60**

Instructions:

i) **All questions are compulsory.**
ii) Figures to the right indicate full marks.
iii) Use of a scientific **calculator** and **statistical tables** is **allowed.**
iv) Symbols and abbreviations have their usual meanings.

Q.1) Attempt each of the following:

a) **In <u>each</u> of the following cases, choose the correct alternative:** **[1 each]**

i) If $X_1 \sim N(0,1)$, $X_2 \sim N(0,1/2)$ are independent then distribution of $x_1^2 + 2x_2^2$ is

A) χ_1^2 B) χ_2^2 C) χ_3^2 D) N(0,1)

ii) If X follows f-distribution with (4,8) d.f. then E(X) is

A) 4/3 B) 5/3 C) 8/3 D) 3/4

iii) What is the assumption made for performing the two populations variance test?

A) the distribution of random variable is non-symmetric
B) the distribution of random variable has more than one modal class
C) the distribution of random variable has a constant variance
D) the distribution of random variable follows a normal distribution

iv) The rejection probability of Null Hypothesis when it is true is called as?

A) Level of Confidence B) Level of Significance
C) Level of Margin D) Level of Rejection

b) Attempt <u>each</u> of the following: **[2 each]**

i) In each of the following, state whether the given statement is true or false.

1) The mean of t-distribution with 6 d.f. is 6.
2) The p.d.f. of G(1/2, 1/2) is same as that of χ^2 distribution with 1 d.f.

ii) Define the terms "Statistics" and "Null Hypothesis"

iii) State the inter-relations among Chi-square, t-distribution and F-distribution.

iv) If $X \sim \chi_8^2$, then find 'M' such that $P[X \leq M] = 0.5$.

[P.T.O.]

Q.2) Attempt **any three** of the following: **[4 each]**

a) Define the following:

i) Hypothesis
ii) Parameter
iii) Critical Region
iv) Standard Error

b) Describe Paired t-test.

c) A nationalized bank utilizes four teller windows to render fast service to the customers. On a particular day 800 customers were observed. They were given service at the different windows as follows:

Window number	1	2	3	4
Number of customers	150	250	170	230

Test whether the customers are uniformly distributed over the windows. Use 5% level of significance.

d) If X_1 and X_2 are i.i.d. N(0,1) variates find $P((x_1 + x_2)^2 \leq 3.284, (x_1 - x_2)^2 \geq 2.148)$

Q.3) Attempt **any two** of the following: **[6 each]**

a) Define χ^2 - distribution with n degrees of freedom and derive its probability density function

b) Describe the test procedure for testing $H_0 : P_1 = P_2$ against $H_1 : P_1 \neq P_2$. Also state its confidence interval.

c) Let $X_1, X_2, \ldots, X_{10}$ be independent normal variates such that $E(X_r)=0$ and $V(X_r)=r^2$ where r=1,2,…,10. Find $P\left(X_1^2 + \frac{X_2^2}{2^2} + \cdots + \frac{X_{12}^2}{10^2} \leq 7.267\right)$.

Q.4) Attempt **any two** of the following: **[6 each]**

a) Let X follows F with n_1 and n_2 degrees of freedom. Find the mean of X.

b) If X and Y are independent Chi-square variate with m and n d.f. respectively, show that U=X+Y and V= $\frac{X}{X+Y}$ are independently distributed.

c) A manufacture of mixed nuts claims that each box of mixed nuts that he sells contains peanuts, cashews, peacans and butternuts in the proportion of 4:3:2:1. A sample consist of 88 peanuts, 61 cashews, 49 peacans and 52 butternuts. Test the manufacturer's claim using 5% level of significance.

Q 5) Attempt **any one** of the following:

a) I) Describe test procedure for testing $H_0: \mu = \mu_0$ against $H_1: \mu \neq \mu_0$, where μ is the mean of normal population with known variance σ^2. **[6]**

II) A sample of 20 women enrolled in a health program shows mean diastolic blood pressure 90 mm and sample standard deviation 32 mm. Can you conclude that women enrolled in the program have mean diastolic blood pressure 75 mm as recommended by doctors? Also find confidence interval for mean diastolic blood pressure. Use 5% level of significance. **[6]**

b) I) Describe the test procedure for testing goodness of fit of a distribution to the given data. **[6]**

II) Let $\bar{X}$ and S^2 be the mean and variance of a random sample of size 16 from a N(3,64) distribution. Evaluate $P(-1 < \bar{X} < 5, 34.188 < S^2 < 77.244)$. **[6]**

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SYBSC/2024-28 (2)

Exam. Seat No : [ ]

Total No. of Questions: 3

Total No. of Pages: 1

Anekant Education Society's
Tuljaram Chaturchand College of Arts, Science and Commerce, Baramati
(Autonomous)
Affiliated to Savitribai Phule Pune University, Pune
S.Y.B.Sc.
MICROBIOLOGY
SEMESTER III
MIB-201-MJM : BACTERIAL SYSTEMATICS
(NEP Pattern)

Time: One Hour. **(No. of Credits 02)** **Max. Marks: 30**

Instructions to the candidate:

- *All questions are compulsory.*
- *Draw neat and labelled diagram whenever necessary.*

Q.1 (A) Attempt each of the following: **(1 Mark each)**

1. Define –Taxonomy.
2. Define –Neotype.
3. State True or False : Prokaryotes are classified based on 16s rRNA sequence.
4. Fill in the blank : Two organisms with 95% DNA homology can say to be.....
   A. Similar B. Closely related C. Distantly related D. None of these.

(B) Attempt each of the following: **(2 Marks each)**

1. Define – Holotype.
2. What is taxonomy?
3. Write a formula for %G+C content.

Q.2 Attempt <u>any four</u> of the following : **(3 Marks each)**

1. Explain artificial classification system.
2. Explain Whittaker's five kingdom classification.
3. Write a short note on - Cytochrome composition.
4. Describe the different steps involved in numerical taxonomy.
5. Describe Hackel's three kingdom classification system.
6. Write note on Bergey's manual of systematic bacteriology.

Q. 3 Attempt <u>any two</u> of the following : **(4 Marks each)**

1. Explain chemotaxonomy based on isoprenoid quinones.
2. Differentiate three domains as per Carl Woese's classification.
3. Describe DNA hybridization with diagram.
4. Explain binomial nomenclature in detail.