V 05117 III 02

Time:-2:30 hrs. Note:- 1.All questions are compulsory. Total Marks:-75
2.Figures to the right indicate full marks.

Q.1. A State the following sentences are true or fualse (any eight). 08

1 In a district, District Magistrate is the controller of Civil Defence.
2 Only to give the bribe is an offence but not to take it.
3 Consuming tobacco is not a drug abuse.
4 Regular work out is important for good health
5 Salami shastra activity is completed in two steps.
6 For examine arms, rifles are hold with butt at hip and barrel in front at 45° .
7 For group shooting maximum distance between any two rounds in inches is the group.
8 For finding own position map setting is not required.
9 Holding a rifle above head parallel to ground and moving up and down is a signal for enemy seen.
10 Open order is start with right foot.

B Fill in the blanks and rewrite the sentences (any seven). 07

1 Fire can be exstinguished by segregation of fire and ----------from a room on fire.
a) fuel b)water c) sand
2 Female foeticide is a social ----------.
a)evil b) tradition c) offence
3 Salami shastra is offfered to officer --------- .
a) above Lt rank b) below major rank c)of major and above rank.
4 Human body has ------ no of bones.
a)208 b) 207 c)206
5 Be in attention followed by one step ahead and a salute is a procedure of ---.
a) visarjan b) falling out c) open order
6 In LMG firing target, lying firers ---------- and LMG remain in stright line.
a) left side, b) right side c) body.
7 ---------- is hiding one self with the natural things or feaatures.
a) Camouflage b) concealment d) silhoutee
8 There are -------- types of norths.
a) two b) three c) four
9 Malaria is spread by ----------.
a) mosquitoes b) sand fly c) ticks
10 --------- is a natural calamity.
a) accident b) collapse of building c) cyclone

Q.2. A Explain how NCC cadet can provide assistance to civil authority in flood. 8
B What is civil defence? Explain the various civil defence measure with suitable example . 7

OR

A How eradication of a social evil like dowry from society be carried out? 8
B Explain the role of NCC cadet to preach against the corruption in society. 7

Q.3. A How one can maintain personal hygiene to become healthy. 8

B Explain the order and execution of salami shastra. 7

OR

A What are communicable diseases? Give its classification and explain in brief prevention of any one from spreading to healthy person. 8

B Explain sizing and forming of a Squad for drill. 7

Q.4. A Write note on range procedure and safety precautions at short range. 8

B How trigger control is achieved? Explain the exercises for trigger control. 7

OR

A Describe a sequence of firing a shot. 8

B State the principles of firing. Explain in brief procedure at short range. 7

Q.5. Answer the following questions (any three). 15

1 What is map? Explain setting of a map.

2 Describe a procedure for finding own position.

3 What are the methods of description and indication of difficult target? Explain any one with suitable example.

4 What are field signals? State their types and explain any two signals.

5 What is camouflage and concealment? State the precautions to be taken during camouflage.

सूचना – १) सर्व प्रश्न अनिवार्य आहेत. २) उजवीकडील अंक पूर्णगुण दर्शवितात.

वेळ– २.३० तास एकूण गुण–७५

प्र.१ अ खालील विधाने चुक कि बरोबर लिहा. (कोणतेही आठ) ८

१ जिल्हयामध्ये जिल्हाधिकारी नागरी सुरक्षा विभागाचे नियंत्रक असतात.

२ फक्त लाच घेणे गुन्हा आहे पण देणे नाही.

३ तंबाखू खाणे हा अम्मली पदार्थ सेवनाचा प्रकार नाही.

४ नियमित व्यायाम हा चांगल्या आरोग्यासाठी महत्वाचा आहे.

५ सलामी शस्त्र कार्यवाही दोन भागात पूर्ण होते.

६ निरीक्षण के किए जाचशस्त्र मध्ये रायफल अशा स्थितीत पकडल्या जातात जेव्हा रायफळचा बट कमरेजवळ तर बॅरल समोर ४५° अशांत असते.

७ ग्रुप शुटींगसाठी कोणत्याही दोन राऊडस मधील इंचामध्ये मोजलेले जास्तीत जास्त अंतर म्हणजे ग्रुप.

८ नकाशात स्वस्थान शोधण्यासाठी नकाशा सेट करणे गरजेचे नाही.

९ डोक्याच्यावर जमीनीला समांतर धरलेली रायफल व ती खालीवर करणे हा शत्रु दिसल्याचा संकेत आहे.

१० खुली लाईन चलची सुरूवात उजव्या पायाने होते.

प्र.१ ब गाळलेल्या जागा भरा व विधाने पुन्हा लिहा (कोणतेही सात). ७

१ आग लागलेल्या ठिकाणी आग आणि———यांना वेगळेवेगळे करून आग विझविली जाऊ शकते.

अ) इंधन ब) पाणी क) वाळू

२ स्त्री भ्रुण हत्या ही सामाजिक ——— आहे.

अ) कुप्रथा ब) प्रथा क) गुन्हा

३ सलामी शस्त्रने —— अधिकारी यांना सन्मान दिला जातो.

अ) लेफ्टनंट रॅक पेक्षा वरीष्ठ ब) मेजर रॅक पेक्षा कनिष्ठ क) मेजर आणि वरीष्ठ रॅकचे

४ मानवी शरीरात —— हाडे असतात.

अ) २०८ ब) २०७ क) २०६

५ सावधान स्थितीत येऊन एक पाऊल पुढे टाकणे व सॅल्युट करणे ही —— ची कृति आहे.

अ) विसर्जन ब) बाहेर पडणे क) खुली लाईन चल

६ एलएमजी ने फायरींग करताना, टारगेट, जमीनीशी समांतर पडलेल्या स्थितीतील फाययरची —— आणि एलएमजी एका सरळ रेषेत असतात.

अ) डावी बाजू ब) उजवी बाजू क) पूर्ण बॉडी

७ ——— म्हणजे निसर्गातील काही गोष्टी किंवा नैसर्गिक संरचना यांच्या मागे स्वत:ला लपविणे होय.

अ) छलावरण ब) दडविणे क) छायचित्र

८ उत्तर दिशाचे ——— प्रकार आहेत.
अ) दोन ब) तीन क) चार

९ मलेरीया ———मुळे फैलावतो.
अ) डास ब) वाळूवरील माशी क) पिसू

१० ——— ही नैसर्गिक आपत्ती आहे.
अ) अपघात ब) इमारत कोसळणे क) चक्रीवादळ

प्र.२ अ) पूरपरिस्थितीतील नागरी अधिकारी यांना एनसीसी छात्र कश्या प्रकारे सहाय्य उपलब्ध करून देऊ शकतात? स्पष्ट करा. ८

ब) नागरी सुरक्षा म्हणजे काय? विविध नागरी सुरक्षा उपाय योग्य उदाहरण देऊन स्पष्ट करा. ७

किंवा

अ) समाजामधून हुंडा घेण्याची कुप्रथा कशी बंद करता येईल. ८

ब) समाजामध्ये भ्रष्टाचारविरोधी प्रचार करण्याची एनसीसी छात्रांची भूमिका स्पष्ट करा. ७

प्र.३ अ) पुढे सुदृढ व आरोग्य संपन्न होण्यासाठी एखादी व्यक्ति वैयक्तिक आरोग्याची काळजी कशी घेऊ शकते. ८

ब) सलामी शस्त्र करण्यासाठी आदेश व कार्यवाही स्पष्ट करा. ७

किंवा

अ) संसर्गजन्य रोग म्हणजे काय? त्यांचे वर्गीकरण देऊन त्यापैकी कोणताही एक रोग आरोग्य संपन्न माणसापर्यत प्रसार होण्यापासून कसा रोखता येईल स्पष्ट करा. ८

ब) ड्रीलसाठी स्क्वाडचे सायझींग व फॉर्मिंग कसे करतात स्पष्ट करा. ७

प्र.४ अ) 'शॉर्ट रेंजवरील नेमबाजीची कृति व सुरक्षेची दक्षता' यावर टिप लिहा. ८

ब) ट्रीगर नियंत्रण कसे साध्य केले जाते? त्यासाठीचे सराव स्पष्ट करा. ७

किंवा

अ) रायफल मधून एक राऊंड फायर करण्याच्या कृतिचा योग्य क्रम लिहा. ८

ब) फायरींगची तत्वे लिहा. शॉर्ट रेंजवरील कृति थोडक्यात लिहा. ७

प्र.५ खालील प्रश्नांची उत्तरे लिहा (कोणतेही तिन) १५

१ नकाशा म्हणजे काय? नकाशा सेटींग स्पष्ट करा.

२ नकाशात स्वस्थान शोधण्याच्या कृतिचे वर्णन करा.

३ कठीण टारगेट दाखवणे व वर्णन करण्याच्या पध्दतीचे वर्णन एक उदाहरण देऊन स्पष्ट करा.

४ क्षेत्रिय संकेत म्हणजे काय? त्यांचे प्रकार लिहा व कोणतेही दोन स्पष्ट करा.

५ छलावरण व दडवणे म्हणजे काय? छलावरणामध्ये घ्यावयाची दक्षता लिहा.

IV 05117 III 01

SYBA. BCom BSc
FC. 3/4/23

Time:- 2 Hours 30 Minutes. **Total marks -75**

N.B. 1) All Questions are Compulsory.
2) Figures to the Right Indicate Full Marks.

Q.1.A) Briefly Describe the Following Concept. (Any Five) 15

1.Consumerism.

2.Consumer court.

3.Public Interest Litigation.

4. Deep Ecology.

5.Geographical Information System.

6. Time Management.

7.Think Win-Win.

8..Logical Reasoning.

OR

B) Write Comprehensive note on the foundation course semester IV project submitted by you.

Q 2.A) Write any Four success story of 'Right to Information act 2005' 15

OR

B) Explain the need of 'public interest litigation'

Q 3.A) Explain the Eco-Feminism. 15

OR

B) Examine Biocentrism and Ecocentrism as an approach to ecology.

Q 4.A) Explain the role of Technology in social development. 15

OR

B) Discuss on Types of Cyber Crime.

Q 5.A) Explain in detail Maslow's theory of Self Actualization. (Motivation) 15

OR

B) Discuss in detail about NET -SET Examination.

♦ ♦ ♦ ♦ ♦ ♦

मराठी रुपांतर

वेळ- २ तास 30 मिनट. एकूण गुण – ७५

सूचना- १. सर्व प्रश्न अनिवार्य आहेत.

२.उजवीकडील अंक पूर्ण गुण दर्शवितात.

प्रश्न.१अ) खालील संकल्पना स्पष्ट करा. (कोणत्याही पाच) १५

१.ग्राहकवाद.

२.ग्राहक न्यायालय.

३.जनहित याचिका.

४.सखोल परिस्थितिकी.

५.भौगोलिक माहिती प्रणाली.

६.काल व्यवस्थापन.

७.जिंकण्याचाच विचार.

८.सुसंगत युक्तिवाद.

किंवा

ब) पायाभूत अभ्यासक्रम सत्र चार साठी तुम्ही सादर केलेल्या प्रकल्पावर व्यापक टिप लिहा.

प्रश्न.२ अ) 'माहिती अधिकार कायदा २००५'च्या यशस्वीतेच्या कोणत्याही चार कथा लिहा. १५

किंवा

ब) जनहित याचिकांची गरज स्पष्ट करा.

प्रश्न.३ अ) महिला केंद्रित परिस्थितिकी स्पष्ट करा. १५

किंवा

ब) परिस्थितिकी शास्त्राचा एक दृष्टिकोण म्हणून जीवन केंद्रित आणि निसर्ग केंद्रित दृष्टिकोण यांचे परीक्षण करा.

प्रश्न.४.अ) सामाजिक विकासात तंत्रज्ञानाची भूमिका स्पष्ट करा. १५

किंवा

ब) सायबर गुन्ह्यांच्या विविध प्रकारांची चर्चा करा.

प्रश्न.५.अ) मास्लोचा अभिप्रेरण सिद्धांत सविस्तर स्पष्ट करा . १५

किंवा

ब) नेट-सेट परीक्षेबाबत सविस्तर चर्चा करा.

♦♦♦♦♦

SY BSc
17/4/23

IV 2304176 6M

Total Marks: 100 Duration: 3 Hours

N.B. 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Draw neat diagrams wherever necessary.
4) Symbols have usual meanings unless otherwise stated.
5) Use of non-programmable calculator is allowed.

Q.1 A Select correct **ONE OPTION.** **12**

i) Oceanic trenches –
a) are narrow deep troughs b) parallel the edges of continents and island arcs
c) are typically 8-10 km deep d) are broad deep troughs

ii) More than 10,000 transistors are integrated in-
a) LSI ICs b) MSI ICs c) SSI ICs d)VLSI ICs

iii) XCHG is a-
a) Data transfer instruction b) Arithmetic instruction
c) Logical instruction d) I/O and stack pointer instruction

iv) Pulse digital modulation does not consist of-
a) PCM b) FM c) PAM d) PPM

v) When a mass m is suspended from a spring, the amount of the spring stretched is proportional to the force F = mg. Here g is-
a) Linear Acceleration b) Angular frequency
c) Angular velocity d) Acceleration due to gravity

vi) Modulation index in both AM and FM is-
a) Defined differently b) Directly proportional to propagation factor
c) A measure of the depth of modulation d) All above factors are effective

B Answer in **ONE SENTENCE.** **3**

i) Write full form of NMR.
ii) Which instruction is used for exclusive AND in 8085 microprocessor?
iii) Define palaeomagnetism.

C Fill in the **BLANKS.** **5**

i) If relationship of stress and strain holds equally for all directions, a property is called……..
ii) ……is a sensitive instrument that measures and records seismic waves.
iii) SBB M means …….. from accumulator.
iv) The number of lines present in data bus called as …….
v) A……of digital signal is the number of bits sent out by its transmitter in one second.

Q.2 A Attempt **ANY ONE.** **8**

i) State Hook's law. Define stress, strain, elastic substance, plastic substance and elastic limit.
ii) Justify the statement-'Universe is billion years older'.

B Attempt **ANY ONE.** **8**

i) Explain in details, the earth's internal magnetic field.
ii) Write a note on environmental physics.

C Attempt **ANY ONE.** **4**

i) List out different layers of the earth sequentially started from atmosphere.
ii) Write a short note on magnetic anomalies.

Q.3 A Attempt **ANY ONE.** 8

i) Illustrate the function of the following in 8085 microprocessor-
i) Program counter ii) TRAP iii) RST 7.5

ii) Explain the pin out diagram of 8085 microprocessor with their functions.

B Attempt **ANY ONE.** 8

i) Write a program with flow chart to add two 16 bit numbers which are stored in memory location D000H and D001H added to another 16 bit memory location D002H and D003H. The result will store at D004H and D005H.

ii) Draw and explain memory map of 8085 microprocessor.

C Attempt **ANY ONE.** 4

i) What are the features of 8085 microprocessor.

ii) Draw the flow chart of the program to arrange the numbers in descending order.

Q.4 A Attempt **ANY ONE.** 8

i) Describe the frequency modulation.

ii) What is noise? State its side effects on communication.

B Attempt **ANY ONE.** 8

i) Explain in details, the communication system.

ii) Illustrate with example, the concept of duplex massaging in communication.

C Attempt **ANY ONE.** 4

i) State difference between FM and AM.

ii) Distinguish between baseband communication and broadband communication.

Q.5 Attempt **ANY FOUR.** 20

i) Distinguish between higher level language and assembly language.

ii) Draw a neat labelled block diagram of rubidium vapour magnetometer.

iii) Write a program to find the largest number from an array of ten numbers stored in memory location C100H to C109H.

iv) A receiver has input signal of power 2.0 μW and noise power of 0.6 μW. Find the signal to noise ratio.

v) The amplitude of a wave 10 sin (47.3×10^4 t) is modulated by a wave 3 cos (6280 t). Find the equation of the modulated wave. (A.M. factor is 1)

vi) Explain the following instructions of 8085 microprocessor. (a) INX H (b) DCR R

****** *******

5YBSc

15/4/23

W 05104 W 62 (0)

Time: 3 hours **Max. Marks: 100**

NB.:- 1) All questions are compulsory.

2) Figures to the right indicate full marks.

3) Use of log-tables and non-programmable calculator is allowed.

4) Symbols have their usual meanings, unless otherwise stated.

Q1. A) Select correct answer **(12)**

1. The probability density of the given function $\psi = e^{ix}$ is _____
   a) 0 b) 1 c) e^{x} d) e^{-x}
2. Which of the following wave function represent a free particle_____
   a) A sin(kx-ωt) b) A cos(kx-ωt) c) $Ae^{i(kx-\omega t)}$ d) $Ae^{-i(kx-\omega t)}$
3. The energy of a particle in the nth quantum state in a one dimensional box is proportional to _____
   a) n b) n^2 c) 1/n d) $1/n^2$
4. Potential energy of a free particle is _____
   a) positive b) negative c) zero d) none of above
5. A particle is confined to a finite square potential well. The probability of locating the particle just outside the well is _____
   a) infinite b) finite c) zero d) none of above
6. The energy levels of the one-dimensional harmonic oscillator are _____
   a) continuous b) equally spaced c) 2-fold degenerate d) 3-fold degenerate

B) Answer in one sentence **(03)**

1. $|\psi|^2$ represents?
2. What is degeneracy of particle is confined in cubical box having first excited state?
3. What is energy of linear harmonic oscillator in the nth state?

C) Fill in the blanks **(05)**

1. The probability current density of a wave function ψ is ___.
2. Wave functions add, not the _____.
3. The expectation value of the momentum of particle in one-dimensional box of length with hard wall is_____.
4. Different quantum states of a system having same energy are called _____.
5. The energy of bound system are_____.

Q2 A) Attempt any **one** **(08)**

1. Derive an expression for Schrodinger time dependent wave equation.
2. Discuss the basic postulates of quantum mechanics.

B) Attempt any **one** **(08)**

1. Normalize the following wave function:

$\Psi_n = \sin\frac{n\pi x}{l}; 0 < x < l$, where n is an integer.

2. What are operators? Derive an expression for momentum and energy operator.

C) Attempt any **one** (04)

1. Discuss Max-Born interpretation of wave function.
2. Calculate the probability density of the given wave function, $\psi(x, t) = Ae^{i(kx-\omega t)}$.

Q3. A) Attempt any **one** (08)

1. Set up STIE for a particle approaching a step potential with energy less than the height of the step. Solve the equation and obtain expression for reflection coefficient.
2. Write down STIE for a particle in an infinite deep rectangular potential well and show that energy of the particle in the infinite potential well is quantized.

B) Attempt any **one** (08)

1. For a particle in an infinite rectangular well, show that the average value of x is $L/2$. (L= width of the well).
2. A particle is confined to move in a cubical box of side L. The potential inside the box is V, a constant. Set up the wave equation for a particle and find the energy eigen functions.

C) Attempt any **one** (04)

1. Find the probability that particle trapped in a one dimensional box of length L can be found between 0.45L and 0.55L for the ground state.
2. A particle is confined in a cubical box. If $E = 26\frac{\pi^2\hbar^2}{2mL^2}$, calculate degeneracy of energy state.

Q4. A) Attempt any **one** (08)

1. Write down expression for transmission coefficient T of a potential barrier of height Vo and width L for the case $E < Vo$.
2. Establish the Schrodinger wave equation linear harmonic oscillator and solve it to obtain energy eigen value.

B) Attempt any **one** (08)

1. Derive an expression for potential energy of simple harmonic oscillator is $1/2kx^2$.
2. A particle of mass 1 mg is attached to a spring constant 10^{-3} N/m. Calculate its zero point energy and classical value of amplitude of zero point vibration.

C) Attempt any **one** (04)

1. Show that the ground state eigen function of harmonic oscillator

$$\Psi_0(x) = \left(\frac{\alpha^2}{\pi}\right)^{1/4} e^{-\alpha^2x^2/2} \text{ is normalized.}$$

2. A particle of mass 2 mg is attached to a spring constant $2X10^{-3}$ N/m. Calculate zero point energy.

Q.5 Attempt any **Four** of the fillowing (20)

i) Explain expectation values of observables.

ii) If normalized wave function of an oscillator is given by $\psi = Aye^{-y2/2}$, $-\infty<y<\infty$, Find A.

iii) An electron is put in a cubical box of each side is 10^{-10} m. Calculate the energy of ground state.

iv) Find the expectation value of momentum$< p >$for a wave function,

$$\psi(x) = \sqrt{\frac{2}{l}}\sin\frac{\pi x}{l}; 0 \le x \le l$$

v) Explain in short α-decay problem.

vi) Find zero point energy in electron-volt of a pendulum whose period is 1sec.

IV 05103 IV 61(O)

S48SC
13/4/23

Time: 3 hrs **Max. Marks: 100**

N.B.: (1) All questions are compulsory. (2) Figures to the right indicate full marks. (3) Use of non-programmable calculators is permitted. (4) Symbols have their usual meaning.

Q-1 A) **Select the correct option** (12)

i) Fresnel's diffraction due to a narrow wire; the fringe width.....if the diameter of the wire is increased.
a) remains same b) decreases, c) increases,
d) reduces to zero.

ii) When ordinary light is made incident on a quarter wave plate, the emergent light is .....
linearly polarized circularly polarized unpolarized elliptically

iii) In the case of linearly polarized light, the magnitude of the electric field vector.....
a) is parallel to the direction of propagation, b) does not change with time,
c)varies periodically with time d) none of these.

iv) Parallel lading of the 4 bit register means.....
a) left shifting data in all four flip-flops simultaneously, b) right shifting data in all four flip-flops simultaneously c) loading data in two flip-flops, d) loading data in four flip-flops at the same time.

v) Right shifting the contents of shift register by one bit is equivalent to.....
a) dividing the content by 2 b) dividing the content by 10,
c) Multiplying the content by 2, d) Multiplying the content by 10.

vi) According to Huygen's theory: "No backwave" only forward propagation of a wavefront is effective then for 'obl quity factor' θ is:
a) 0°, b) 90°, c) 180°, d) 45°

B) **Answer in one sentence** **(3)**

i. Define Latch.
ii. What is Elliptically polarized?
iii. Define count up counter.

C) **Fill in the blanks** **(5)**

i. Transverse nature of light was confirmed by the phenomenon of ..... of light.

ii. To note diffraction, the size of the obstacle / slit :.....
iii. To observe Fraunhoffer diffraction, wavefront should be.....
iv. The velocity of light in air is $3x10^8$ m/sec and that in water is $2.2 x10^8$ m/s. The polarizing angle of incidence is .....
v. Fresnel's diffraction due to a narrow wire the fringe width.... if the diameter of the wire is increased.

Q-2 A Attempt any one **(8)**

i. Give an account of Fresnel's type diffraction effect produced by a narrow

rectangular slit. Explain if a point is
i) Near the geometrical shadow. ii) In the geometrical shadow

ii. Explain the intensity distribution on the screen when a monochromatic light normally illuminates the plane transmission grating. Discuss the formation of secondary maxima and minima.

B **Attempt any one** **(8)**

i. In case of Fresnel's diffraction at a straight edge show that the diffraction bands produced are not equally spaced.

ii. Discuss an elementary treatment of diffraction of a monochromatic light by a thin wire. How will you use the pattern to determine a) The wavelength (λ) of light, or b) The diameter of the wire.

C **Attempt any one** **(4)**

i. Explain Huygens theory of Diffraction.

ii. A light of wavelength 6000 Å is placed at a distance of 10 cm from a narrow straight rectangular slit. If the distance between the second and the first dark band is 1.5 mm find the distance of screen from the straight edge.

Q-3 A **Attempt any one** **(8)**

i. Describe in brief any two methods for producing plane polarized light.

ii. What do you understand by 'double refraction'? Explain production of linearly polarized light through Nicol prism.

B **Attempt any one** **(8)**

i. Write a note on: Polarizer-Analyzer, Anisotropic crystal, Calcite Crystal

ii. State and Explain Law of Malus.

C **Attempt any one** **(4)**

i. Write a note on wire grid polarizer.

ii. Quartz crystal has refractive index 1.553 and 1.544 for extraordinary and ordinary ray respectively. Find the thickness of the quarter wave plate for sodium light of wavelength 5890 °A.

Q-4 A **Attempt any one** **(8)**

i. Explain the operation of MOD-3 counter with the help of its back diagram and output waveforms..

ii. Draw master slave JK flip-flop system? Explain its operation.

B **Attempt any one** **(8)**

i. Draw and construct a PIPO shift register which consist of five flip-flops

ii. What is the need of clocking a flip-flop? Give the truth table of a clocked R-S flip-flop and explain its truth table.

C **Attempt any one** **(4)**

i. Perform the following subtractions using 2's complements
(c) 1110 11101 (a) 01100-00110 (c) 01000-01001 (b) 011.1001-0001.1110

ii. Convert the following decimal numbers into binary and Octal.
375, 249, 27.125

Q-5 **Attempt any four** **(20)**

i. A narrow slit is illuminated by light of wavelength placed of 0.1 m away from a straight edge. If the distance between the first and the second dark band is 0.7786 x 10^{-3} m determine the wavelength of the source it the screen is at a 0.5 m away from the edge.

ii. Explain the phenomenon of polarization by selective absorption

iii. Draw a truth table of Half adder And Full adder.

iv. What is positive edge triggering and negative edge triggering of flip-flop?

v. A quartz crystal has refractive indices 1.55085 and 1.54181. Determine the thickness of half- wave plate for the Fraunhofer (line) of wavelength 6563 A.

SYBSc
12/4/23

[V230412 56M]

Time: - 2 hr. 30 min. **Marks: -75**

N.B. **1) All questions shall be compulsory with internal choice within the questions.**
2) Figures to the right indicate marks.
3) Illustrations, in-depth answers and diagrams will be appreciated.
4) Mixing of sub-questions is not allowed.

Q1 **Attempt any four.** **20**

a) What is dependent and independent variable? Explain.
b) Distinguish between research methods and research methodology.
c) Write a note on following type of research
a) Applied and Fundamental b) Quantitative and Qualitative
d) Discuss problems encountered by researchers in India.
e) Explain various steps helpful in the research process.
f) Describe research design in case of descriptive and diagnostic research studies.

Q2 **Attempt any four.** **20**

a) What do you mean by secondary data collection? Explain.
b) Explain and illustrate the procedure of selecting a random sample.
c) What is a hypothesis? Enlist the characteristic of good research hypothesis?
d) Are the following nominal, ordinal, interval or ratio data? Explain your answers.
i. Hair color
ii. Level of education
iii. Temperature in Fahrenheit
e) What is Systematic and stratified sampling? Explain.
f) List and explain any three merits and demerits of case study method.

Q3 **Attempt any four.** **20**

a) What are the eight steps of writing a research proposal?
b) "Interpretation is a fundamental component of research process". Explain.
c) When can you use abbreviations in your writing a paper? Explain with a suitable example.
d) Write a brief note on rewriting and publishing of report.
e) How do you write a good abstract for a research paper? Explain.
f) What is a scientific paper? Explain ethics in scientific publishing a scientific paper.

Q4 **Attempt any five.** **15**

a) What are the categories of experimental design?
b) Which are characteristics of a good research report?
c) What do you mean by level of significance?
d) Write a short note on validity.
e) How to design effective tables?
f) Enlist the basic elements in citation.

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IV 05131 III 57

54B3C
12/4/23

Time – 2 1/2 hours **Marks–75**

Note: Attempt **all** questions.
All questions carry **equal** marks.
For **Q.2, Q.3 and Q.4** attempt A and B **OR** C and D
Draw **neat labeled diagrams** wherever necessary.

Q.1 **A)** **Do as directed. (Any fifteen)** **(15)**

Define-

1. Entrepreneur
2. Leadership

State true or false.

3. Entrepreneurship cannot promote regional development.
4. Entrepreneur requires organization skills.

Fill in the blanks.

5. _____helps to improve business culture.
6. The quality and quantity of _____ influences the emergence and growth of entrepreneurship.
7. Entrepreneurship development required to help_____.
8. _____is the ability to deal with differences openly and resolve them through teamwork.
9. _____is soul of planning.
10. Dogma is_____ of all evil for business ideas.
11. _____ enables to reduce national contributions.

State true or false.

12. Plans should be made rigid.
13. In business plan, be realistic.
14. Define- Business grant
15. Give two examples of advertising media.

State true or false.

16. Primary research consists of data collected directly from customers.
17. Domestic marketing deals with only one market.

Define

18. Marketing management
19. Joint venture
20. Give any one objective of conducting market research.

P.T.O.

Q.2	A)	Discuss the features of entrepreneurship.	(08)
Q.2	B)	Explain the factors affecting entrepreneurship development.	(07)
		OR	
Q.2	C)	Elaborate on the economic factors contributing to growth of entrepreneurship.	(08)
Q.2	D)	Describe in detail the need for entrepreneurship.	(07)
Q.3	A)	Explain in detail the importance of planning.	(08)
Q.3	B)	Describe the qualities of good business plan.	(07)
		OR	
Q.3	C)	What is EDI? Explain its functions in detail.	(08)
Q.3	D)	Explain in detail board of directors.	(07)
Q.4	A)	What is strategic alliance? Explain in detail the types of strategic alliance.	(08)
Q.4	B)	Elaborate on key differences between domestic and International marketing.	(07)
		OR	
Q.4	C)	What is marketing research? Discuss the process of conducting market research.	(08)
Q.4	D)	What is marketing? Explain the marketing plan for an entrepreneur.	(07)
Q.5		**Write short notes on any three of the following.**	(15)

a. Barriers of entrepreneurship
b. Motives of entrepreneur
c. Five C's of business plan
d. Difference between Advertising and sales promotion
e. Creativity

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5YBSc
12/4/23

IV 23041253 M

Time: $2\frac{1}{2}$ *hour* **Total Marks: 75**

Instructions: 1. All questions are compulsory.

2. Figure to the right indicate full marks.

3. Use of calculator is allowed.

Q.1. A) Attempt any one from the following. **(8)**

a) Find a real root of the equation $f(x) = x^3 - 2x - 5 = 0$ by Regula-Falsi Method

b) Derive a formula for Secant Method and solve $x^{2.2} = 69$

B) Attempt any two from the following. **(12)**

a) Derive formula for Newton-Raphson method for finding root of equation.

b) Round-off the following numbers to two decimal places:

i) 48.21416, ii) 2.3742, iii)52.275, iv)2.375, v)2.385, vi)81.255

c) Define the term absolute error. Given that a = 10.00±0.05 b=0.0356± 0.0002 c=15300+100 d= 62000+500, find the maximum value of the absolute error in

(i) a + b + c + d (ii) a +5c-d

d) Using Iteration method, find the real root of cosx=3x-1

Q.2. A) Attempt any one from the following. **(8)**

a) Values of x (in degrees) and sin x are given in the following table:

x(in degree)	15	20	25	30	35	40
Sin x	0.258819	0.3420201	0.4226183	0.5	0.5735764	0.6427876

Determine the value of sin 38° by using Newton's backward difference formula.

b) Find the values of a, b and c so that $Y = a + bx + cx^2$ is the best fit to the data

x	0	1	2	3	4
y	1	0	3	10	21

B) Attempt any two from the following. **(12)**

a) Derive the formula of Trapezoidal Rule and solve $I = \int_0^1 \frac{1}{1+x} dx$ for h=0.5

b) Evaluate $\int_0^1 \frac{1}{1+x^2} dx$ by using i) Simpson's 1/3 rule taking h=1/4

ii) Simpson's 3/8 rule, h=1/6

c) If $y_1 = 4$, $y_3 = 12$, $y_4 = 19$ and $y = 7$, find x using Lagrange's interpolation.

d) Fit a straight line of the form $y= a_0+a_1x$ to the data.

x	1	2	3	4	6	8
y	2.4	3.1	3.5	4.2	5.0	6.0

Q.3. A) Attempt any one from the following. **(8)**

a) Using Jacobi method find all the eigen values of the given matrix $A = \begin{pmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{pmatrix}$

b) Solve the equations x+y+z=1, 4x+3y-z=6, 3x+5y+3z=4 using Doolittle's method.

B) Attempt any two from the following. **(12)**

a) Obtain LU Decomposition of the matrix $A=\begin{bmatrix} 4 & 1 \\ 2 & 4 \end{bmatrix}$ by Crout's Method.

b) Solve the system of equations x + y= 2, 3x+2y = 6 by Doolittle method.

c) Find all the eigenvalues of the matrix $A=\begin{bmatrix} 4 & 3 \\ 1 & 2 \end{bmatrix}$ using Rutishauser Method.

d) Find H and c for the given system of equations using Gauss-Seidel Method

2x-y=7, -x+2y-z = 1, -y+2z=1

Q.4. Attempt any three from the following. **(15)**

a) Obtain the LU decomposition of a matrix $A=\begin{bmatrix} 3 & 2 & -3 \\ 2 & 2 & 5 \\ 1 & 1 & -1 \end{bmatrix}$.

b) Find all the eigenvalues of $A=\begin{bmatrix} 1 & -2 \\ -2 & 5 \end{bmatrix}$ using Jacobi method.

c) Calculate the value of $\sqrt{102} - \sqrt{99}$ correct to four significant figures.

d) Certain corresponding values of x and $\log_{10} x$ are (300, 2.4771), (304, 2.4829), (305, 2.4843) and (307, 2.4871). Find $\log_{10} 301$.

e) Find the least positive root of the equation tan x = x to an accuracy of 0.0001 by Newton-Raphson method.

f) Evaluate $\int_0^{\frac{\pi}{2}} \sqrt{sin\theta}\, d\theta$ Using Simpson's rule with $h=\pi/12$

SYBSc
12/4/23

IV 05131 III 52

Please check whether you have got the right question paper

N. B. 1) All questions are **compulsory.**

2) All questions carry **equal marks.**

3) **Draw** neat labeled **diagrams** wherever **necessary.**

4) Figures to the right indicate full marks.

Q. 1. A) Fill in the blanks by choosing the correct option given in the bracket. **05**

a) .....egg contain negligible amount of yolk.
(Polylecithal, Mesolecithal, Oligolecithal)

b) The .....cleavage is the result of unequal holoblastic type of division of egg.
(radial, spiral, bilateral)

c) The surgical procedure in the male is called.....
(tubectomy, vasectomy, termination)

d) .....layer is the outermost cover of the earth crust.
(Biosphere, Hydrosphere, Lithosphere)

e) The nutrients present in fertilizers can lead to excessive algal growth causing.....
(deforestation, eutrophication, biomagnifications)

Q. 1. B) Match the columns I and II and rewrite. **05**

Column I	Column II
1) Alecithal eggs	a) Female sterilization
2) Radial cleavage	b) Male infertility
3) Tubectomy	c) Salinization
4) Cryptorchidism	d) Eutherians
5) Water pollution	e) Echinoderms

Q. 1. C) State whether True or False. **05**

a) Coeloblastula is common in eggs having low yolk content.

b) The invertebrates which develop amnion are called as amniotes.

c) Development of secondary sexual characters in female is under control of estrogen.

d) Lead emission through vehicles is due to use of diesel.

e) The Kyoto Protocol was related to the climate change.

Q. 1. D) Answer the following in one sentence only. **05**

a) Define isolecithal eggs.

b) What is blastula?

c) What is condom?

d) Write any two sources of natural air pollutants.

e) What is radioactive pollution?

(P.T.O.)

Q. 2. A) Describe types of eggs based on amount of yolk. **10**

OR

A) Describe types of cleavages based on symmetry. **10**

Q. 2. B) Answer any two of the following: **10**

a) Describe holoblastic cleavage.
b) Describe types of movements in epiboly.
c) Describe formation of amnion and allontois.
d) Describe the yolk sac in amniotes.

Q. 3. A) Describe hormonal regulation of female reproductive system. **10**

OR

A) Explain the causes of male infertility. **10**

Q. 3. B) Answer any two of the following: **10**

a) Explain the sperm bank.
b) Describe the endometriosis and syphilis.
c) Describe barrier methods of contraception.
d) Describe polycystic ovarian syndrome.

Q. 4. A) Describe types and sources of air pollutants. **10**

OR

A) What is soil pollution? Describe the types and control measure of soil pollution.

Q. 4) Answer any two of the following: **10**

a) Explain types and sources of solid waste pollution.
b) Describe the effects of water pollution.
c) Describe the sources and effects of noise pollution.
d) Explain climate change and global warming.

Q. 5) Write short notes on (any four) **20**

a) Gastrulation in birds.
b) Extra embryonic membranes.
c) Female reproductive system.
d) *In vitro* fertilization.
e) Components of atmosphere.
f) Control measures of noise pollution.

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SYBSc
11/4/23

IV05128III45

Time – 2 $^{1/2}$ hours **Marks–75**

Note:

1) Attempt **all** questions.
2) **All questions** carry **equal** marks.
3) For **Q.2,Q.3 and Q.4** attempt A and B **OR** C and D
4) Draw **neat labeled diagrams** wherever necessary.

Q.1 **Do as directed. (Any fifteen)** **(15)**

1. Give uses of proteinase K.
2. Enlist any one method of protein separation.
3. ..... blotting technique is used for isolation of RNA sample.

State true or false

4. Nucleic acid absorbs light at 260nm through the adenine residues.
5. Give the role of restriction endonucleases.
6. ..... is strong denaturant of RNAase.
7. Give example of DNA transfer methods from the gel to membrane.
8. Enzymatically amplification of DNA is calledas.....
9. Give an application of thermostable DNA ligase.
10. Define "Amplicon"
11. What is the significance of thermocyclers?
12. Give significance of ligase chain reaction.
13. Enlist the general steps of PCR.

State true or false

14. DNA can be found in aerosol.
15. What is SNP?
16. ..... gene analysis is done to detect fragile X diagnostics.
17. ..... is time period between exposure to HIV and before seroconservation.
18. Intrapartum transmission of *N.gonorrhoeae* produces ..... condition in neonates.
19. State significance of carrier testing.
20. Give use of genetic privacy.

Q.2 **A)** Explain in detail probe labelling method. **(08)**

Q.2 **B)** Elaborate on FISH as a hybridization technique. **(07)**

OR

Q.2 **C)** Discuss the organic method for isolation of DNA. **(08)**

Q.2 **D)** Explain in detail southern blotting technique. **(07)**

Q.3 **A)** Discuss in brief the ligase chain reaction for probe amplification. **(08)**

Q.3 **B)** Give working principle of qRT PCR. **(07)**

OR

Q.3 **C)** What is the function of DNA polymerase in PCR? What are the different types of DNA polymerase used in PCR method? **(08)**

Q.3 **D)** What is mispriming? Explain prevention of mispriming in detail. **(07)**

P.T.O.

Q.4	**A)**	Describe molecular testing of *N.gonorrhoeae*.	**(08)**
Q.4	**B)**	Discuss in brief diagnostics testing for cystic fibrosis.	**(07)**

OR

Q.4	**C)**	Explain the components of genetic counselling process.	**(08)**
Q.4	**D)**	Describe the social and legal issues to molecular genetic testing.	**(07)**

Q.5 **Write short notes on any three of the following.** **(15)**

a. Protein probes

b. Fluorometry measurement of nucleic acid

c. Physical methods used for control of PCR contamination

d. PCR product clean-up

e. Gene patenting

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SYBSc
11/4/23

IV05128III41A

Time: 3 Hrs. **Marks: 100.**

Please check whether you have got the right question paper.

NB: 1. All questions are compulsory and carry equal marks.

2. Figures to the right indicate full marks.

3. Draw neat and labeled diagrams wherever necessary.

4. Attempt the questions in order.

Que.1. **A** **Fill in the blanks by choosing the correct options.** 05

a Cells were first seen and described by……in 1665.(Anton van Leeuwenhoek,Robert Hook,Theodore Schwann)

b The……state is a resting phase or nondividing phase. (Prophase, Anaphase, Interphase)

c Communication between plant cells takes place through fine strands of actin passing through the cytoplasm which are called as…… (Plasmodesmata, Microvilli, Desmosomes)

d The cell engulfs drops of fluid by pinching in and forming vesicles is known as……(Exocytosis, Phagocytosis, Pinocytosis).

e ……. Protein is abundantly found in the most of eukaryotic cells. (Actin, Myosin, Albumin)

B **Match the column I and II and rewrite.** 05

	Column I		**Column II**
a	Endoplasmic reticulum	i	Smooth endoplasmic reticulum
b	Golgi complex	ii	Process of the ATP production
c	Detoxification	iii	Cisternae (lamellae)
d	Lysosomes	iv	Autophagy
e	Bioenergetics	v	Dalton and Felix

C **State whether true or false.** 05

a The term macromolecule was coined by H.Staudinger.

b Aldehyde or Ketone derivatives of polyhydroxy alcohols are called as Protein.

c Amino acids have capacity to polymerize and make polypeptides.

d The term protein was coined by G. J. Mulder.

e Lipids are composed of short chain hydrocarbons.

D **Define the following.** 05

a Nucleus

b Passive transport

c Desmosomes

d Amino acids

e Lipid.

Que.2. **A** Describe generalized prokaryotic and eukaryotic cell. 10

OR

	A	Discuss anchoring junctions.	
	B	**Explain any Two from the following:**	**10**
	a	Structure of interphase nucleus	
	b	Fluid Mosaic Model	
	c	Endocytosis	
	d	Functions of microfilaments.	
Que.3.	**A**	Describe polymorphism in lysosomes.	**10**
		OR	
	A	Describe ultra structure of Golgi complex.	
	B	**Explain any Two from the following:**	**10**
	a	General morphology of endoplasmic reticulum	
	b	Functions of Golgi complex	
	c	Ultra structure of mitochondria	
	d	Bioenergetics.	
Que.4.	**A**	Explain the concept of Micromolecules and Macromolecules.	**10**
		OR	
	A	Discuss biological role and clinical significance of carbohydrates.	
	B	**Explain any Two from the following:**	**10**
	a	Classification of carbohydrates	
	b	Properties and classification of amino acids on the basis of polarity.	
	c	Saturated and unsaturated fatty acids	
	d	Water soluble vitamins.	
Que.5.		**Write short notes on any four.**	**20**
	a	Properties of carbohydrate	
	b	Amino acids based on nutritional requirements	
	c	Ultra structure of nuclear pore complex	
	d	Structure of Endoplasmic reticulum.	
	e	General morphology of endo membrane system	
	f	Lysosome origin and occurrence.	

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SYBSc
11/4/23

IV 23041141 BM

Time: $2\frac{1}{2}$ hours **Full Marks: 75**

Instructions: 1) All questions are compulsory.
2) Figures to right indicate full marks.
3) Use of calculator is NOT allowed.

Q1. Attempt any FOUR. **(20)**

i) Let V & V' be real vector spaces and $T: V \to V'$ be a linear transformation. Then prove that range of T is subspace of V'.

ii) Check whether the transformation $T: \mathbb{R}^4 \to \mathbb{R}^3$ given by, $T(x, y, z, w) = (x + y, y + z, z + w)$, is linear transformation or not.

iii) Does there exists a linear transformation $T: \mathbb{R}^2 \to \mathbb{R}^2$ such that $T(1, -1) = (4,6)$, $T(3,2) = (1, -4)$ and $T(8,9) = (1,5)$?

iv) Find the matrix associated with the following linear transformation. $T: \mathbb{R}^3 \to \mathbb{R}^2$ defined by $T(x, y, z) = (x - 2y, y - 5z)$.

v) Let V & V' be real vector spaces and $T: V \to V'$ be a linear transformation. Then prove that T is injective if and only if $\ker T = \{0_v\}$.

vi) Verify Rank-Nullity theorem for the following linear transformation. $T: \mathbb{R}^3 \to \mathbb{R}^2$ given by $T(x, y, z) = (x + y, y - x)$.

Q2. Attempt any FOUR. **(20)**

i) Find an eigenvectors corresponding to each eigenvalues for the matrix $A = \begin{bmatrix} 3 & -2 \\ 2 & -2 \end{bmatrix}$

ii) Show that eigenvectors corresponding to distinct real eigenvalues of a $n \times n$ matrix are linearly independent.

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

iv) Let A be $n \times n$ real diagonal matrix then prove that eigenvalues of A are the principle diagonal entries of A.

v) Define similar matrices & prove that similar matrices have same characteristics polynomial.

vi) Find $\det(A)$ using eigenvalues for the matrix $A = \begin{bmatrix} 3 & 10 & 5 \\ -2 & -3 & -4 \\ 3 & 5 & 7 \end{bmatrix}$

Q3. Attempt any FOUR. **(20)**

i) State & prove Cauchy-Schwartz inequality.

ii) State & prove Pythagoras theorem for inner product space.

iii) Check whether $(\mathbb{R}^2, <>)$ & $< x, y > = 5x_1y_1 + 8x_2y_2$ is an inner product space or not.

iv) State & prove Parallelogram law of vectors using inner product.

v) Find projection of $p(x) = x$ on $q(x) = x^2 + 1$ using $< p, q > = \int_0^1 p(x)q(x)dx$.

vi) Let $(V, <>)$ be an inner product space then show that ,$\|x + y\| \leq \|x\| + \|y\|$ for all $x, y \in V$.

Q4. Attempt any THREE. **(15)**

i) Find kernel and image for the following linear transformation , $T: \mathbb{R}^2 \to \mathbb{R}^2$ given by $T(x, y) = (y, y + 2x)$.

ii) Let $T: \mathbb{R}^2 \to \mathbb{R}^2$ be a linear map. If $T(1,1) = (1,4)$ & $T(2, -1) = (-2,3)$, then find $T(3, -1)$.

iii) Check whether the set $\{(1,0,0), (1,1,0), (1, -1,1)\}$ is orthogonal basis & orthonormal basis.

iv) Find A^{-1} of $A = \begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix}$ by Cayley-Hamiltom theorem.

v) Find the orthonormal basis of the subspace W generated by $\{(1, -1,2), (0,2, -1)\}$

SYBSc
16/4/23

IV05126III30

[Time : Three Hours] **[Marks : 100]**

Please check whether you got the right question paper.

N.B.: 1. All questions are compulsory.
2. All questions carry equal marks.
3. Draw neat labeled diagrams wherever necessary.

Q. 1) A) Choose correct answer and complete the following sentences. **05**

i) In ..... only hard remains of organism get preserved while soft part decay.
a) cast b) molt
c) petrification d) compression

ii) The titanic explosion due to which the universe came in existence is known as .....
a) bang-bang b) big-bang
c) universal explosion d) mass explosion

iii) ..... occurs below species level.
a) Microevolution b) Megaevolution
c) Macroevolution d) Mass evolution

iv) Part of chromosome breaks and joins other non homologous chromosome in called as .....
a) transduction b) inversion
c) deletion d) translocation

v) Acceptable techniques and procedures of anaesthesia are described in guidelines of .....
a) INSA b) AFFA
c) NASA d) WHO

B) State whether the following sentences are true or false. **05**

1) Life originated in hyper saturated oceans.
2) Connecting links possess characteristics of two different successive groups.
3) Inbreeding means production of offspring by non related parents.
4) Fossils have no role in paleontology.
5) In scientific research critical thinking has greater importance.

C) Define the following terms. **05**

1) Coacervates.
2) Somatoplasm.
3) Prokaryotes.
4) Analytical Research.
5) Scientific dada.

D) Answer in one sentence. 05

1) Which animals are known as diplobastic?
2) What is embryology?
3) Define alleles.
4) What is translocation?
5) What is applied research?

Q. 2) A) Answer <u>any one</u> of the following. 10

1) What is role of anatomical evidences in favor of organic evolution? Explain in detail.
2) What is Hardy-Weinberg law? Explain with Hardy-Weinberg equation.

B) Write short notes on <u>any two</u> of the following. 10

1) Evidences from genetics in favor of organic evolution.
2) Homologues organs.
3) Origin of eukaryotic cell.
4) Weismann's germ plasm theory.

Q. 3) A) Answer <u>any one</u> of the following. 10

1) Explain genetic drift.
2) Explain non-random mating.

B) Write short notes on <u>any two</u> of the following. 10

1) Allelic frequency.
2) Gene pool.
3) Deductive reasoning.
4) Deletion.

Q. 4)A) Answer <u>any one</u> of the following. 10

1) Explain components of research paper
2) Define scientific research and explain its types

B) Write short notes on <u>any two</u> of the following. 10

1) Technical problem.
2) State Biodiversity Board.
3) Use of tables and figure for data representation.
4) Bibliography.

Q. 5) Write short notes on <u>any four</u> of the following. 20

1) Darwinism.
2) Connecting links.
3) Heterogamy.
4) Pre-zygotic isolation.
5) Interpretation of data.
6) Monograph.

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SYBSc
10/4/23

TV 2304 1031 M

Total marks: 75 **Duration: 2 ½ hrs.**

N.B.1) All questions are compulsory.

2) Figures to the right indicate full marks.

Q.1 A] Attempt any one of the following. **(8M)**

1. $f, g: S \subseteq \mathbb{R}^n \to \mathbb{R}$ be scalar fields are continuous at $a \in S$. Then prove that $f + g$, $f - g, \alpha f$ are also continuous at a.
2. Let $f: S \to \mathbb{R}^m$ be a vector field given by $f(x) = (f_1(x), f_2(x), \ldots, f_m(x))$. Let $l = (l_1, l_2, \ldots, l_m) \in \mathbb{R}^m$ then prove that $\lim_{x \to a} f(x) = l$ iff $\lim_{x \to a} f_i(x) = l_i$.

B] Attempt any two of the following. **(12M)**

1. Draw the Open ball $B(0,1)$ in $\mathbb{R}^2$ with respect to norm defined as $\|(x, y)\| = |x| + |y|$.
2. Find $\lim_{(x,y,z) \to (0,0,0)} f(x, y, z)$ if exists for $f: \mathbb{R}^3 \to \mathbb{R}$ defined by $f(x, y, z) = 4x + 2y + z$.
3. Find the directional derivatives of $f(x, y) = x^2 + 2xy$ at (0,0) in the direction of (1,-1).

Q.2 A] Attempt any one of the following. **(8M)**

1. Let $f: S \subseteq \mathbb{R}^n \to \mathbb{R}$ be a scalar field and let S be non empty open subset of $\mathbb{R}^n$. If f is differentiable at $a \in S$ then prove that the total derivative of f at a is unique.
2. Let $a \in S$ and suppose ∇f and ∇g both exists at a then prove that
   (i) $\nabla(f + g)$ exists at a and $\nabla(f + g)(a) = \nabla f(a) + \nabla g(a)$
   (ii) $\nabla(\alpha f)$ exists at a and $\nabla(\alpha f)(a) = \alpha \nabla f(a)$
   (iii) $\nabla(f.g)$ exists at a and $\nabla(f.g)(a) = f(a)\nabla g(a) + g(a)\nabla f(a)$.

B] Attempt any two of the following. **(12M)**

1. Evaluate the total derivative of the function $f: \mathbb{R}^2 \to \mathbb{R}$ defined by $f(x, y) = 3x$.
2. Find gradient of the function $f(x, y) = e^x . \cos(y)$ at (1, 0).

3. Find $f_{xy}(0,0)$, $f_{yx}(0,0)$ and check whether they are equal where

$$f(x,y) = \frac{xy^3}{(x^2+y^2)} \qquad \text{for } (x,y) \neq (0,0)$$

$$= 0 \qquad \text{for } (x,y) = (0,0)$$

Q.3 A] Attempt any one of the following. **(8M)**

1. let S be non empty open subset of $\mathbb{R}^n$ and $f: S \to \mathbb{R}^m$ is differentiable at $a \in S$, then f is continuous at a.
2. State and prove Taylors formula for the function of 2 variables.

B] Attempt any two of the following. **(12M)**

1. Find the Jacobian matrix of $f: \mathbb{R}^4 \to \mathbb{R}^2$ defined by

   $f(x,y,z,w) = (x^2 + 2y, x + z^2 + 3w^2)$ at (3, 1, 0, -1).
2. Examine the following function for extrema values.

   $f(x,y) = y^2 + 4xy + 3x^2 + x^3$
3. Find the direction in which f increases most rapidly for the function. Also find maximum rate of change. $f(x,y,z) = \sin(x+y) + \sin(y+z) + \sin(x+z)$ at $\left(\frac{\pi}{2}, \frac{\pi}{2}, \frac{\pi}{2}\right)$.

Q.4 Attempt any three of the following. **(15M)**

1. Find iterated limit of $f(x,y) = \frac{x^2y^3}{(x^2+y^2)}$ for $(x,y) \neq (0,0)$

   $= 0$ for $(x,y) = (0,0)$
2. Locate the critical points of $f(x,y) = x^3 - 6xy + 3y^2 - 2yx + 4$.
3. Let $S = \{(x,y,z) \in \mathbb{R}^3 / \, x^2 + y^2 < 1, z = 0\}$. Show that S is not open set.
4. Find $\frac{\partial f}{\partial x}$, $\frac{\partial f}{\partial y}$ and $\frac{\partial f}{\partial z}$ at (1,2,1) if $f(x,y,z) = x^{y^z}$.
5. Find derivative of z with respect to t if $z = 3x^3y + 4y^3$ and $x = \sin(5t), y = \cos(5t)$. Also find $\frac{dz}{dt}$ at $t = \pi/2$.

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TE 05123 III 27

Time – 2 1/2 hours | Marks–75

Note: Attempt **all** questions.
All questions carry **equal** marks.
For **Q.2,Q.3 and Q.4** attempt A and B **OR** C and D.
Draw **neat labeled diagrams** wherever necessary.

Q.1 A) Do as directed. (Any fifteen) **(15)**

1. ..... pollution comes from one specific point or location.
2. Define- Greenhouse effect
3. Enlist any two microorganisms used in bioremediation.
4. What are radioactive pollutants?
5. State true or false – A full list of Greenhouse gases is called as kytoprotocol.
6. Microbial bioremediation helps to convert toxic components into..... components.
7. Define -Air pollution
8. State true or false – Emission of greenhouse gases can be controlled by better management.
9. During acid rain pH reaches to.....
10. Enlist the names of any two techniques used in Bioremediation.
11. Depletion of forest cover is called as.....
12. Define- Acid rain
13. State true or false -Contaminants that enter ground water remain for decades.
14. Define - ex-situ Bioremediation
15. State true or false- Electronic waste is called as e-waste
16. .....are non-reactive, non-flammable and volatile liquids.
17. Define - Bioremediation.
18. .....are responsible for causing biological pollution.
19. What is salinization?
20. State true or false- Acid rain causes lakes and rivers to become acidic

Q.2 A) Explain in detail classification of air pollutants. **(08)**

Q.2 B) Elaborate on factors affecting soil erosion. **(07)**

OR

Q.2 C) Describe in detail water pollution and its causes. **(08)**

Q.2 D) Discuss in brief about impact of solid waste on health. **(07)**

P.T.O

Q.3	A)	Explain in detail on factors responsible for Greenhouse effect.	(08)
Q.3	B)	Describe in detail on ozonedepletion.	(07)
		OR	
Q.3	C)	Explain in detail causes of global warming.	(08)
Q.3	D)	Discuss in detail UV radiation.	(07)
Q.4	A)	Elaborate on concept of Bioremediation.	(08)
Q.4	B)	Discuss in detail role of microorganisms in Bioremediation	(07)
		OR	
Q.4	C)	Explain in brief role of bioaugmentation.	(08)
Q.4	D)	Describe in detail about phytoremediation.	(07)
Q.5		**Write short notes on any three of the following.**	(15)

a. Causes of water erosion
b. In-situ bioremediation
c. Types of water pollutions
d. Mycoremediation
e. Sources of air pollution

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UV05123III23

S4BSc
8/4/23

Q.P. Code:

Duration: 3 hours Total marks: 100

N. B.
1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of log table / non-programmable calculator is allowed.

Q.1 **Select the correct option and complete the following sentences.** 12
(Attempt any twelve)

A. a) Physical method of separation based on gravity is --------.
i) precipitation ii) filtration iii) centrifugation

b) Separation of colloidal particles in Electrophoresis is dependent on the ----- of solution.
i) concentration ii) absorbance iii) pH

c) In -------- chromatographic technique, liquid act as a mobile phase and solid act as stationary phase.
i) GLC ii) HPLC iii) TLC

d) ---------- extraction technique is used when the amount to be extracted is large.
i) Continuous ii) Batch iii) Counter

e) In paper chromatography, samples are dissolved preferably in -------solvent.
i) aqueous ii) volatile iii) non-volatile

f) The mechanism of separation in Colum chromatography is ----------.
i) partition ii) absorption iii) adsorption

g) Saturated calomel electrode possesses the -------- potential.
i) low ii) constant iii) high

h) Circle fitting method is used for determination of ----------.
i) end point ii) equivalence point iii) polarization point

i) In conductometric titration ---------of the solution changes during the course of titration.
i) Conductance ii) potential iii) pH.

j) It is preferable to use a weak base rather than a strong base to titrate a ------- ----------acid.
i) Strong ii) moderately weak iii) very strong

k) For conductance cell ---------- is constant and is called cell constant.
i) ratio a/l ii) ratio l/a iii) product of 'l x a'

l) Calibration of pH meter can be carried out by using buffer of --------- and any other buffer with pH value near expected measurements.
i) pH 9.2 ii) pH 4.1 iii) pH 7

m) The accuracy of the measurement is described in terms of ----------.
i) absolute error ii) mean iii) standard deviation

n) The difference between the maximum and minimum value in the set of measurements is called ----------.
i) variance ii) range iii) deviation

o) Gaussian distribution curve is symmetrical around ----------.
i) μ ii) S iii) x

p) Method of averages is used for ----------.
i) rejection of data
ii) testing of significance
iii) obtaining best fitting line

e) Confidence interval in terms of student's 't' is defined as ----------.

i) $\bar{x} \pm \frac{ts}{\sqrt{n}}$ ii) $\bar{x} \pm \frac{ts}{n}$ iii) $\bar{x} \pm \frac{ts}{n^2}$

f) The ratio of standard deviation to mean is called ----.

i) relative standard deviation
ii) absolute standard deviation
iii) relative average deviation

B. **State whether the following statements are true or false.** 03
(Attempt any three)

a) In paper chromatography, the paper act as inert support for the stationary liquid phase.
b) In adsorption chromatography, the stationary phase has to be liquid.
c) Combined glass electrode contains a reference electrode and ion selective electrode together.
d) pH metric titration method is applicable to coloured solutions.
e) Scatter diagram is a plot of the two experimentally measured variables.
f) Indeterminate errors are also known as random errors.

C. **Match the following.** (Attempt any five) 05

	Column A		Column B
a)	Iodine chamber	i)	GLC
b)	Metal ion separation	ii)	Platinized platinum electrode
c)	Reference electrode	iii)	TLC
d)	Conductance cell	iv)	Square of standard deviation
e)	2.5d rule	v)	Best fitting line
f)	Variance	vi)	Rejection of doubtful value
		vii)	paper chromatography
		viii)	Saturated calomel electrode
		ix)	Silver electrode

Q.2 **Attempt any four of the following.**

a) What are the different types of methods of separation? Explain the filtration and crystallization on the basis of solubility. 05
b) Explain multistep extraction is more convenient than single step extraction. 05
c) i) 200 cm^3 of water contains 20 mg of an acid. It is shaken with 50 cm^3 of an organic solvent. At equilibrium it is observed that 5 mg of the acid remains unextracted. Calculate the distribution ratio of the acid between water and the organic solvent. 03
ii) Explain Zone electrophoresis method of separation 02
d) What is basic principle of paper chromatography? Explain it with respect to i) stationary phase ii) preparation of the sample iii) Application of the sample. 05
e) Explain, thin layer chromatography with respect to i) stationary phase ii) Mobile phase iii) Preparation of plate. 05
f) What are different types of distillations? How the process of distillation can be used for the separation of two liquids? 05

Q.3 **Attempt any four of the following.**

a) Explain the principle of conductometric Titration. 05
b) Explain the principle of pHmetry and different types of pH meters. 05
c) State the advantages and limitations of conductometric titrations. 05
d) Describe suitably set up of galvanic cell used for potentiometry. 05
e) Describe with neat labeled diagram the conductometric titrations of i) strong acid vs strong base and ii)weak acid vs weak base 05
f) Describe the construction and working of combined glass electrode 05

Q.4 **Attempt any four of the following.**

a) Define mean and median.
Calculate the mean and median for the following set of values,
25.55, 25.45, 25.53, 25.49, 25.47, 25.52
b) Explain the significance of F-test.
Applying F-test determine whether the two standard deviations 0.06065 and 0.07505 obtained by two different methods for the same sample differ or numerically or statistically also.
(F_{table} = 6.61 at 95% probability level)
c) Define absolute deviation, relative deviation, average deviation, standard deviation and coefficient of variation.
d) Explain, Q-test used for the rejection of doubtful data.
In the analysis of magnesium content of a sample, following values were reported; 2.6, 2.7, 2.8, 3.1
Find whether the value 3.1 can be retained or rejected on the basis of Q-t
(Q_{table} = 0.76 at 90% confidence level)
e) The pH of the solution was determined with the following results,

Trials	1	2	3	4	5
pH	4.63	4.65	4.67	4.66	4.60

Calculate the standard deviation and variance
f) The estimation of lead in a water sample gave following results in ppm, 0.152, 0.142, 0.164, 0.162
Calculate the 95% confidence interval for the mean. The value of 't' for 4 is 3.18.

Q.5 **Attempt any four of the following.**

a) Explain the applications of Thin layer chromatography.
b) i) Explain the term partition coefficient.
ii) Explain the Radial developments in paper chromatography.
c) State the applications of pH metry in biological and environmental field
d) Write note on methods of determination of equivalence point graphycally
e) Explain least square method.
For the following data, derive an equation of the type y = mx by using lea square method.

x	1	2	3	4	5
y	5.1	5.3	5.5	5.8	6.1

f) What is null hypothesis? Outline a procedure for the application of null hypothesis to data.

IV 05120 III 16

S4BSc
6/4/23

Duration: 3 hours Total marks: 100

N. B.
1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Use of log table / non-programmable calculator is allowed.

Q.1 **Select the correct option and complete the following sentences.** 12
(Attempt any twelve)

A. a) The property of the catalyst to change the direction of reaction is called ----.
i) catalytic activity ii) catalytic selectivity iii) catalytic poisoning

b) The number atoms belongs to the unit cell of simple cubic lattice are -------.
i) 1 ii) 4 iii) 2

c) -------- is used to measure the interfacial angle.
i) Goniometer ii) monometer iii) colorimeter

d) The ratio of interplanar distances $d_{100}:d_{110}:d_{111}$ for simple cubic lattice is ---.
i) 1 : 0.707 : 0.577 ii) 1 : 0.707 : 1.154 iii) 1 : 1.154 : 0.577

e) Acid catalyzed reaction proceeds --------.
i) with transfer of a proton from an acid to substrate
ii) with transfer of a proton from substrate to acid
iii) without transfer of protons

f) --------- is used in the conversion of maltose into glucose.
i) Maltase ii) Zymase iii) Diastase

g) Latimer equation is valid only for cations that have electronegativity -------.
i) < 1.5 ii) >1.5 iii) =1.5

h) With the increase in electronegativity of halogens, the basicity of their oxo anions ----------.
i) increases ii) decreases iii) remain unchanged.

i) Anions with pK_b values ---------- are weakly basic anions.
i) between 1 and 6. ii) between 6 and 11.5 iii) between - 4 and 1.

j) ----------is called as sulphuric anhydride
i) SO_3 ii)S_2O_7 iii) SO_2

k) ---------- is used as anesthetic and as a propellent in aerosol cans.
i) N_2O_4 ii) N_2O iii) SO_2

l) ---------- is the only inorganic acidulant used in soft drinks.
i) H_3PO_3 ii) HNO_3 iii) H_2SO_3

m) When nitrile is treated with $LiAlH_4$ followed by hydrolysis gives ---- amine.
i) primary ii) secondary iii) tertiary

n) Hoffmann rearrangement which converts ---------- to a primary amine with one carbon atom less.
i) acid chloride ii) amide iii) anhydride

o) Benzene diazonium chloride on treatment with ethanol gives ----------.
i) phenol ii) ethyl benzene iii) benzene

p) In pyrrole , nitrogen atom is ---------- hybridized.
i) sp^2 ii) sp iii) sp^3

q) Nitration of furan is carried out by using ----------.
i) conc. HNO_3 ii) dilute HNO_3 iii) acetylnitrate

r) Nitrous acid is obtained by reaction of ---------- and mineral acid.
i) sodium nitrate ii) sodium nitrite iii) sodamide

B. **State whether the following statements are true or false.** 03
(Attempt any three)

a) A catalyst increases the energy of activation of a chemical reaction.
b) The angle between the two intersecting faces of crystal is always constant.
c) Lesser the charge to radius ratio less acidic the cation.
d) HS^- is the anion which can act as both acidic and basic.
e) Piperidine is a secondary amine.
f) In pyridine, electrophilic substitution takes place at position 3 and 5.

C. **Match the following. (Attempt any five)** 05

	Column A		Column B
a)	Inhibitor	i)	$\frac{a}{2} : \frac{a}{\sqrt{2}} : \frac{a}{2\sqrt{3}}$
b)	Body centered cubic lattice	ii)	Retards rate of reaction
c)	N_2O	iii)	Non-aromatic compound
d)	SO_2	iv)	Aromatic compound
e)	Hoffmann degradation	v)	Br_2/KOH
f)	Piperidine	vi)	colourless with sweetish taste
		vii)	$\frac{a}{2} : \frac{a}{\sqrt{2}} : \frac{a}{\sqrt{3}}$
		viii)	colourless and suffocating odour
		ix)	Coloured with irritating odour

Q.2 **Attempt any four of the following.**

a) Explain the characteristic features of catalysis. 05
b) Explain the terms, 05
i) Homogeneous and heterogeneous catalysis
ii) Catalytic poisoning
c) What are nano particles? What are the properties of nanoparticles? 05
d) With suitable diagram explain the characteristics of simple cubic and face centered cubic lattice. 05
e) Derive, Bragg's equation. 05
f) CaF_2 crystallises in a face centred cubic lattice with an edge length of 546×10^{-12} m. its molecular weight is 78.0×10^{-3} kg mol-1 and its density 3.18×10^3 kg m^{-3}. Calculate the Avogadro number. 05

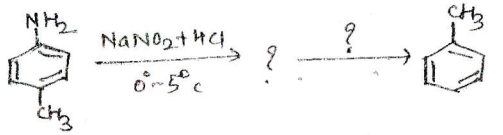
Q.3 **Attempt any four of the following.**

a) What are predominance diagrams? Explain any two predominance diagram for anions and partially protonated anions. 05
b) Explain hydrolysis of cations. 05
c) Explain classification of mono atomic cations on the basis of the extent of acidity with suitable examples. 05
d) Explain the probable mechanism of acid rain. Support your answer with flow chart. 05
e) Explain pollution of atmosphere by PAN and its effect on human health. 05
f) Explain properties and uses of sulphuric acid. 05

Q.4 **Attempt any four of the following.**

a) i) How will you prepare Aniline from chlorobenzene and Nitrobenzene? 03
ii) Explain Hoffmann degradation of amide with example. 02
b) i) What is the action of following reagent on aniline? 03
Acetic anhydride , Nitrous acid and Methyl iodide
ii) Explain the diphenylamine is less basic than aniline. 02

c) i) How will you distinguish the ethyl amine, diethylamine and triethylamine using nitrous acid?
ii) Complete the following sequence of reaction.



d) i) What is diazotisation reaction? Give its possible mechanism.
ii) Draw the resonating structures of pyridine.
e) i) Explain the aromaticity of thiophene.
ii) Describe the Paal-Knorr synthesis of pyrrole.
f) i) What is the action of following reagents on Furan?
Cyclopropene, pyridine in SO_3 and Acetyl nitrate
ii) Explain 'Pyrrole dissolved in KOH'

Q.5 **Attempt any four of the following.**

a) Derive Michaelis – Menten equation for enzyme catalysis.
b) Explain with neat diagram (100), (110) and (111) planes in simple cubic lattice.
c) Explain environmental aspects of oxides and oxyacids of phosphorous.
d) Explain uses and sources of sulphuric acid.
e) Describe Hantzsch synthesis of pyridine.
f) How aniline is converted to benzoic acid and Iodobenzene?

S4BSc
6/4/23

IV 05/20 III 20

Marks–75

Note: Attempt **all** questions.
All questions carry **equal** marks.
For **Q.2.Q.3 and Q.4** attempt A and B **OR** C and D
Draw **neat labeled diagrams** wherever necessary.

Q.1 A) Do as directed. (Any fifteen) (15)

1. Give the name of antibiotics used in treatment of syphilis.
2. What is opportunistic pathogens?
3. Define sporadic disease.
4. The presence of bacteria in the blood is known as ---------.
5. Define carrier.
6. Give the name of disease which is caused by contact transmission.
7. Define epidemiology.
8. What is liquefaction?
9. Give the names of *Proteus spp.*
10. Tubercle bacilli that reach the alveoli of lung are ingested by macrophage. (State true or false)
11. Give the names of bacteria which ferment the lactose.
12. Which toxins are produced by *E.coli*?
13. --------can cause the local infection impetigo. (State true or false)
14. What is gummas?
15. Gonorrhea is caused by ---------.
16. State the significance of RPR test.
17. Give characteristics of *S.typhi.*
18. Which media is used for isolation of *Shigellae*?
19. Define convalescent carriers.
20. Give the names of bacteria which cause nosocomial infection.

P.T.O

Q.2	**A)**	Discuss in brief Normal microbiota.	(08)
Q.2	**B)**	Give an account on exceptions to Koch's postulates.	(07)
		OR	
Q.2	**C)**	Explain in detail role of microorganism in nosocomial infection.	(08)
Q.2	**D)**	Describe spread of infection.	(07)
		OR	
Q.3	**A)**	Elaborate on Lab diagnosis of tuberculosis.	(08)
Q.3	**B)**	Give an account on *E.coli*.	(07)
		OR	
Q.3	**C)**	Describe in detail infection caused by *S.pneumoniae*.	(08)
Q.3	**D)**	Discuss in brief *S.aureus* infection.	(07)
Q.4	A)	Describe in detail pathogenicity of *Shigellae spp*.	(08)
Q.4	B)	Explain epidemiology of *Salmonella spp*.	(07)
		OR	
Q.4	C)	Elaborate on Gonorrhea disease.	(08)
Q.4	D)	Give an account on sexually transmitted diseases.	(07)
Q.5		**Write short notes on any three of the following.**	(15)

a. Development of disease

b. Diagnosis of Syphilis

c. Control of nosocomial infection

d. Opportunistic microorganism

e. EPEC

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IV05118III13

SYBSc Che II
5/4/23

Time – 2 1/2 hours | Marks–75

Note:

1) Attempt **all** questions.
2) **All questions** carry **equal** marks.
3) For **Q.2,Q.3 and Q.4** attempt A and B **OR** C and D
4) Draw **neat labeled diagrams** wherever necessary.

Q.1 **A)** **Do as directed. (Any fifteen)** **(15)**

1. Define "Sampling unit"
2. Define "Distillation"
3. Define "Population"
4. Distribution ratio has units of mol/dm^3. (True or False)
5. Solvent extraction is liquid-liquid extraction process. (True or False)
6. The sample prepared by mixing the increments is called as universe. (True or False)
7. _____ sampling requires minimum knowledge of bulk material.

Draw the structure of-

8. Vitamin A
9. Testosterone
10. Camphor
11. HPTLC is a planar chromatographic technique. (True or False)
12. Gas chromatography is used for separation of non-volatile mixtures.
13. In HPLC separation is carried out at _____ temperature.
14. The gas is used as the mobile phase in gas chromatography is called _____.
15. Polymers are micromolecules. (True or False)
16. In random polymer two monomers are randomly distributed. (True or False)
17. Colloidal particles have small surface to volume ratio. (True or False)

Draw the structures of-

18. ε- caprolactum.
19. Polystyrene.
20. Define- syndiotacticity.

Q.2 **A)** Define distribution ratio. Obtain the expression for it. **(08)**

Q.2 **B)** Describe ambient sampling method for sampling of gases. **(07)**

OR

Q.2 **C)** Explain how filtration process is useful for separation. **(08)**

Q.2 **D)** Discuss in detail non-random sampling. **(07)**

Q.3 **A)** Write the applications and limitations of HPTLC. **(08)**

Q.3 **B)** Explain the use of ozonolysis reaction in structure determination of terpenoids. **(07)**

OR

Q.3 **C)** Give the synthesis of α-ionone and β-ionone from citral. **(08)**

Q.3 **D)** Elaborate on pumping system used in HPLC. **(07)**

P.T.O.

Q.4	A)	Write in detail the sol-gel method used in synthesis of nanoparticles.	(08)
Q.4	B)	Describe the preparation and uses of polyurethane.	(07)
		OR	
Q.4	C)	Discuss the synthesis and uses of phenol formaldehyde resins.	(08)
Q.4	D)	Elaborate on nanotubes and nanowires.	(07)

Q.5		**Write short notes on any three of the following.**	(15)
	a.	Steps involved in sampling	
	b.	Chelation	
	c.	Fat soluble vitamins	
	d.	Polyester	
	e.	Elastomers	

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IV 05118 III 09

Q.P. Code:

Duration: 3 hours Total marks: 100

N. B.

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

Q.1 **Select the correct option and complete the following sentences.** 12
(Attempt any twelve)

A. a) Eutectic point in two component system is ----------.
i) monovariant ii) bivariant iii) invariant

b) The number of degree of freedom of the system,
$CaCO_{3(solid)} \rightarrow CaO_{(solid)} + CO_{2(gas)}$
i) 1 ii) 2 iii) 3

c) Hydrogen gas electrode is used to measure ----------.
i) absorbance ii) conductanceiii) pH

d) In galvanic cell, the electrode at which --------- take place is written at left hand side.
i) oxidation ii) reduction iii) decomposition

e) Water system has ---------- stable curves.
i) 4 ii) 2 iii) 3

f) E^{o}_{cell} for spontaneous cell reaction is ---------,
i) Positive ii) negative iii) equal to zero.

g) The first series of transition element comprises of -----to -----elements.
i) Ca to Cu ii)Sc to Zn iii) Ti to Ga

h) Mercury is excluded from third transition series as it has--------'d' orbital.
i) empty ii) half filled iii) completely filled.

i) In charge transfer spectra when metal oxidised and ligand reduced is called-----------.
i) MLCT ii) LMCT iii) ILCT

j) Dien is a ------- ligand.
i) tridentate ii) tetradentate iii) bidentate

k) Coordination position isomerism is found in ---------- complexes.
i) polynuclear ii) ionic iii) neutral

l) ---------- this complex follow the EAN rule.
i) $[Ag(NH_3)_2]Cl$ ii)$K_4[Fe(CN)_6]$ iii) $[Ni(NH_3)_6]^{2+}$

m) Common name of 2-hydroxybenzoic acid is ----------.
i) p-Anisic acid ii) o-Toluic acid iii) Salicylic acid

n) Acetic acid can be prepared by oxidation of ---------- using $K_2Cr_2O_7$ and dil. H_2SO_4.
i) ethene ii) ethanol iii) ethane

o) An ester is obtained by refluxing carboxylic acid with excess of ---------- in presence of acid as a catalyst.
i) Alcohol ii) alkyl halide iii) alkene

p) When a diester having α- H atoms is heated with a basic catalyst ---------- is obtained.
i) cyclic α-keto ester ii) cyclic β-keto ester iii) β- keto ester

q) Sulfonic acid is ---------- acid as compared to carboxylic acid.
i) weak ii) stronger iii) equally

r) Salicylic acid is heated strongly with soda lime gives ----------.
i) benzoic acid ii) phenol iii) benzene

B. **State whether the following statements are true or false.** 03
(Attempt any three)

a) The cell in which chemical energy is converted into an electrical energy is known as galvanic cell.

b) The substance having congruent melting point decomposes into new solid and solution.

c) In the complexes with coordination number six, the arrangement of ligands is alwaysoctahedral.

d) Siderite is the ore of iron.

e) Salicylic acid is stronger acid than benzoic acid.

f) The carboxylic acids when treated with $LiAlH_4$ gives a secondary alcohol.

C. **Match the following.** (Attempt any five) 05

	Column A		Column B
a)	Reference electrode	i)	$NH_4Cl_{(s)} \rightleftharpoons NH_{3(g)} + HCl_{(g)}$
b)	One component system	ii)	Sp^3
c)	$[Ni(Cl)_4]$	iii)	$Hg_{(l)} - Hg_2Cl_{2(s)} \mid KCl_{(aq)}$
d)	$[Ni(CN)_4]$	iv)	$Cu_{(s)} \mid Cu^{2+}{}_{(aq)}$
e)	Oleum	v)	Cyclic β- keto ester
f)	Dieckmann condensation	vi)	dsp^2
		vii)	H_2SO_4
		viii)	$H_2S_2O_7$
		ix)	H_3PO_4

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

a) Derive Nernst equation for the emf of galvanic cell. 05

b) What is condensed phase rule? Explain the phase diagram of lead-silver system. 05

c) With suitable example, explain gas electrode. 05
Calculate the electrode potential of $Ag_{(s)} \mid AgCl_{(s)}$, KCl (0.1 M) at 298K.
(Given: $E^0 = 0.2223$ V)

d) State the phase rule and with suitable example, explain the meaning of number of phases and number of components. 05

e) i) Distinguish between reversible and irreversible cells. 05
ii) For the following galvanic cell, write the electrode reactions and cell reaction,
$Zn_{(s)} \mid Zn^{2+}{}_{(aq)} \parallel Ag^{+}{}_{(aq)} \mid Ag$

f) Define incongruent melting point and explain the phase diagram of system having incongruent melting point. 05

Q.3 **Attempt any four of the following.**

a) Explain magnetic properties of transition elements.

b) State and explain oxidation states of elements of first transition series.

c) What are important ores of Ti? Explain its extraction.

d) State and explain postulates of Werners Coordination theory.

e) Explain Linkage isomerism with suitable example.

f) State and explain in brief applications of coordination compounds.

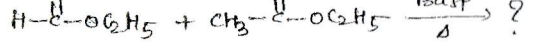
Q.4 **Attempt any four of the following.**

a) Give any two methods of preparation of carboxylic acids.

b) What is nucleophilic acyl substitution? Write the mechanism of convers of acetyl chloride to acetamide.

c) What is the action of following reagents on benzoic acid?
i) soda lime ii) PCl_5 iii) $NaHCO_3$ iv) ethanol / H^+ v) P_2O_5

d) Complete the following reaction and name the reaction involved. Give i mechanism.



e) i) Carryout the following conversions with suitable reagent
phthalic acid into phthalic anhydride,
benzoic acid into benzyl alcohol and
benzoic acid into methyl benzoate
ii) Explain 'p-Toluic acid is weaker than benzoic acid

f) How is picric acid prepared through sulphonic acid by IPSO attack?

Q.5 **Attempt any four of the following.**

a) Draw the phase diagram of sulphur system and explain the triple points i

b) Explain the use of quinhydrone electrode for determination of pH of the solution. What are the merits of quinhydrone electrode?

c) Write a note on origin of colour for transition metals and their compoun

d) Name the coordination compounds-
i) $[Co(en)_3]Cl_3$ ii) $Na_3[Fe(C_2O_4)_3]$
iii) $[PtBr_2(NH_3)_4]Br_2$ iv) $(NH_4)_2[Pt(SCN)_6]$

e) Explain Hell-Volhard –Zelinsky reaction with mechanism.

f) What is sulphonation? Explain the mechanism of sulphonation of benzer