Class:- F.Y.I.T. Subject: Computational Logic & Discrete Structure

Date:- 01/3/2025 Time:- 12.30 PM to 2.00 PM

Time: 2.30 Hrs. **Full Marks: 75**

Instructions:
(1) All questions are compulsory.
(2) Numbers to the right indicate full marks.
(3) Use of scientific calculator is allowed.

Q.1) **Attempt any three of the following** (15)

a) If A={1,2,3,4} and B= {a,b}, find A×B, B×B, B×A, A×A.

b) Let, A={a,b} , B={1,2} and C={2,3}.Find each of the following sets
(a)A×(BUC)
(b)(A×B) U (A×C)

c) Simplify truth table
(P/\q) \/ (~P\/(P/\~q))

d) Let , E= {1,2,3} and F={-2,-1,0} and define a relation T:E→F as follows:
For all (x,y) ∈ E×F, (x, y) ∈T means that $\frac{X-Y}{3}$ is an integer.
(i) Is 3T0?, Is 1T(-1)?,Is (2,-1) ∈T?, Is (3,-1) ∈T?
(ii) Write T as a set of ordered pairs
(iii) Write the domain and co-domain of T.
(iv) Draw an arrow diagram for T.

e) Verify truth table
(P\/q)\/(P/\r) = (P\/q)/\r

f) Define ,a)Set b)Proper subset c) Power set d) Subset e)Disjoint set

Q.2) **Attempt any three of the following** (15)

a) Let D= {-48,-14,-8, 0, 1, 3, 16, 23, 26, 32, 36} determine which of the following statements are true and which are false. Provide counter examples for those statements that are false
(i) For all x∈D, if x is odd then x>0
(ii) For all x∈D, if x is less than 0 then x is even
(iii) For all x∈D, if x is even then x≤0
(iv) For all x∈D, if the ones digit of x is 2, then the tens digit is 3.
(v) For all x∈D, if the ones digit of x is 6, then the tens digit is 1or 2.

b) If m mod 11 = 6 then what is 4m mod 11?

c) If r and s are two rational numbers then (r+s)/2 is rational

d) Prove that for all integers n, n^2-n+3 is odd

e) For all integers n≥0. 2^{2n-1} is divisible by 3

f) Prove that $1+3\sqrt{2}$ is irrational

Q.3) **Attempt any three of the following** (15)

a) If $f(x) = 2x+3$ and $g(x) = 1-x^2$. Find the composite function defined by $(fog)(x)$ and $(gof)(x)$. Verify whether $(fog)(x) = (gof)(x)$.

b) Show that for all integers $k \geq 0$; if $p(k)$ is true then $p(k+1)$ is also true.

c) Prove that 3^{2n-1} is divisible by 8, for each integer $n \geq 0$.

d) Let $f: R \setminus \{3\} \rightarrow R \setminus \{0\}$ be defined by $f(x) = 1/(x-3)$ then prove that f is bijective and hence find the formula for f^{-1}.

e) Solve the recurrence relation
$Tn=5Tn_{-1} - 6Tn_{-2}$ where $T_0= 7$, $T_1= 16$

f) Let $A = \{0, 1, 2, 3, 4\}$ and define function $f: A \rightarrow A$ as follows: for each $x \in A$, $f(x) = (x+4)^2 \bmod 5$ and $g(x) = (x^2+3x+1) \bmod 5$. Is $f=g$? Explain

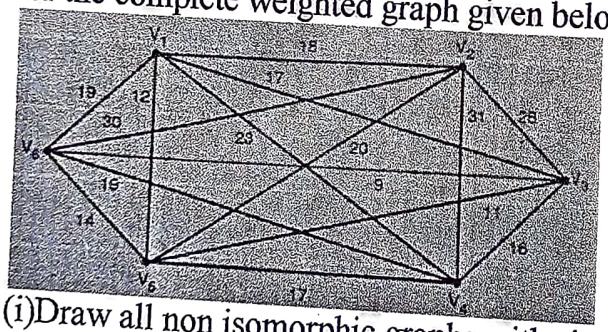
Q.4) **Attempt any three of the following** (15)

a) Let $A=\{a,b,c,d,e,f\}$ and partial order relation R on A is define as $R=\{(a,a), (b,b), (c,c), (d,d), (e,e), (a,c), (c,d), (c,e), (a,d), (a,e), (b,c), (b,d), (b,e)\}$. Find matrix of relation R (M_R) and draw diagraph of a relation R.

b) Define the following:
i)Trail **ii)**Connected graph **iii)**Spanning tree **iv)** k-regular graph **v)** Simple graph

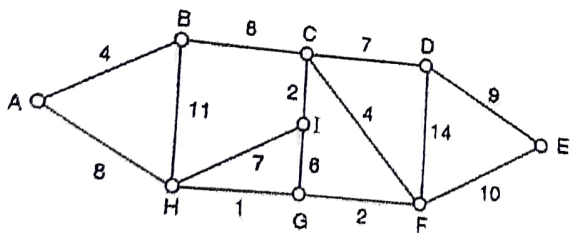
c) Explain rooted tree and binary tree. Draw binary tree to represent the following expressions:
i) ((a-b).c)+(d/e))
ii) a.b- (c/(d+e))

d) Find the shortest path from vertex V1 to all vertices by applying Dijkstra's Algorithm for the complete weighted graph given below



e) (i)Draw all non isomorphic graphs with six vertices all having degree 2
(ii)Draw for non isomorphic graphs with 6 vertices two of degree 4 and four of degree 3.

f) Find the minimum spanning tree of the following weighted graph with Kruskal's algorithm



Q.5) **Attempt any three of the following** **(15)**

a) If P (A) =⅗,P (B) = ⅔,P (A/B) =1/7 findP (A ∩ B) and P (B/A).

b) If A and B are two events such that P(A) =0.9, P(B)= 0.8, P(AUB)=0.7.Find P (A ∩B),P (A/B),P (B/A).

c) How many different number of 4 digits can be made out of the digits 0,1,2,3,4,5 such that
   i) No digit is repeated
   ii) Repetition of digits is allowed.

d) An organization consists of 9 members of which 4 are doctors. A selection of 4 person is to done among these member. Find how many selection will have
   i) No doctor
   ii) Exactly two doctor
   iii) All four doctors
   iv) At least three doctors
   v) At most one doctor

e) Card is drawn at random from a well shuffled pack of cards. Find the probability that it is a:
   i) Red card or a king
   ii) A king or a queen

f) Find the number of distinct permutations of the letters of the word
   i)SURROUNDINGS ii) ASSASSINATION

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Class: F. Y. B. Sc. Course Code: USZO101 Subject: Zoology Paper: I

Semester: I (ATKT) Course: I Time: Three hours. Marks: 100

Date - 01/03/2024, Time - 12.30 pm to 3.30 pm

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

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

a) Bats emits.....cries and use the echoes of these sounds to see in the dark.
(echosonic, ultrasonic, supersonic)

b) .....is a typical desert animal.
(Kangaroo rat, Snake, Bird)

c) In Darwin's frog .....exhibited parental care.
(male, female, male and female both)

d) .....is the *ex-situ* conservation technique done at very low temperature.
(Tissue culture, Gene bank, Cryopreservation)

d) .....is the largest biotech company in Asia.
(AMUL, DHARA, BIOCON)

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

Column I	Column II
i) Echolocations	a) Cuckoo
ii) Ashokvan	b) Egg laying Mammal
iii) Opium poppy	c) Dolphins
iv) Platypus	d) Baba Amte
v) Brood parasitism	e) Morphine

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

a) Earthworms do not show considerable power of regeneration.
b) In Sea horse parental is care exhibited by the female.
c) Biodiversity is the degree of variation of life.
d) Indian Wildlife protection Act 1972 offers protection to birds and mammals only.
e) Dr. Varghese Kurian is Father of White Revolution.

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

a) Define the parental care.
b) Define the mimicry.
c) Give full form of IUCN.
d) What is biodiversity hot spot?
e) Name the book written by Dr. Salim Ali.

(P.T.O.)

Q. 2. A) Describe briefly, the types of migration in birds. 10

OR

A) Describe adaptive features in desert animals. 10

Q. 2. B) Write short notes on (any two) 10

a) Parental care in Kangaroo.

b) Types of coral reefs.

c) Mechanism of pearl formation in Mollusca.

d) Regeneration in animals.

Q. 3. A) What is biodiversity? Give an account on conservation of biodiversity. 10

OR

A) Describe the Western Ghats biodiversity hotspot. 10

Q. 3. B) Write short notes on (any two) 10

a) *In-situ* conservation strategies.

b) Levels of biodiversity.

c) Indian Wildlife Act 1972.

d) National Parks.

Q. 4) Answer any two of the following 20

a) Describe the life sketch of Dr. Salim Ali.

b) Give an account of work and achievements of Dr. Hargobind Khorana.

c) Describe in detail - Amul White revolution.

d) What is Anandvan? State the contribution of Dr. Baba Amte on it.

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

a) Bioluminescence.

b) Mimicry in butterflies.

c) Man-wildlife conflict.

d) Scope of Biodiversity.

e) BIOCON.

f) Surimi.

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FYBSc

Time:2.30 Hrs

TOTAL MARKS: 75

N.B. 1. All questions are compulsory.

2. Figure to the right indicate full marks.

3. Use of calculator is not allowed.

Q.1. a) Attempt any ONE question from the following. (8)

A. Define the real number. State Algebraic properties of real numbers (any five) with example also state order properties of real numbers.

B. State and prove Archimedean and property of $\mathbb{R}$.

b) Attempt any TWO questions from the following. (12)

A. If x, y, z are non-negative real no. P.T
$(x+y)(y+z)(z+x) \geq 8xyz$

B. State and prove properties of absolute value.(Any 3)

C. Which of the following sets are bounded above and bounded below. Find the supremum of the sets if they exist. Justify your answers.

(i) $A = \{2^n \mid n \in N\}$

(ii) $B = \{\frac{-1^n}{n} \mid n \in \mathbb{N}\}$

D. Let A and B are two bounded subset of real no. such that A is subset of B then show that $\text{Inf } B \leq \text{inf } A \leq \text{sup } A \leq \text{sup } B$

Q.2. a) Attempt any ONE question from the following. (8)

A. .Define Cauchy sequence and bounded sequence in $\mathbb{R}$. Show that every Cauchy sequence is bounded in $\mathbb{R}$

B. Let sequence $(x_n) = \frac{n}{n+1}$ and sequence $(y_n) = \frac{n+1}{n}$ then solve sum, difference, product and quotient for given sequences.

b) Attempt any TWO questions from the following. (12)

A. State whether given sequence is monotonic or not $(x_n) = \frac{3n+4}{5n+9}$

B. Using definition of limit of the sequence show that
$$\lim_{n\to\infty} \frac{3}{n+1} = 3$$

C. Using sandwich theorem prove that $\lim_{n\to\infty} \frac{n-1}{n^2+2} = 0$

D. Prove that every convergent sequence is Cauchy.

Q.3. a) Attempt any ONE question from the following. (8)

A. Solve $x^3 \frac{dy}{dx} = y^3 + y^2\sqrt{y^2 - x^2}$

B. Solve $\frac{dy}{dx} = \frac{x+2y-3}{2x+y-3}$

b) Attempt any TWO questions from the following. (12)

A) Solve $(x-y)^2\, dy = a^2\, dx$

B) Solve $(15x+11y)dx + (5y + 9x)\, dy = 0$

C) Solve $(y^4+2y)dx + (xy^3 +2y^4 - 4x)dy = 0$

D) Solve $xy(1+xy^2)\frac{dy}{dx} = 1$

Q.4. Attempt any Three question from the following. (15)

A. Define Bounded set and Give an example of a set which is

(i) bounded above but not below. (ii) bounded below but not above.

B. State and Prove A.M-G.M inequality.

C. Is bounded sequence Cauchy? Justify.

D. Give an example of monotone sequence which is not bounded.

E. Solve $ylogydx + (x-logy)dy = 0$

F. Solve $[\log(x^2 + y^2) + \frac{2x^2}{x^2+y^2}]dx + \frac{2xy}{x^2+y^2}dy = 0$

Total marks: 75M 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. State and prove Division Algorithm in $\mathbb{Z}$.
2. Show that number of primes is infinite.

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

1. For any positive integer n, Prove that $n(n+1)$ is divisible by 2.
2. Find g.c.d. of 2210 and 357 and express it in the form of $2210x + 357y$ for suitable $x, y \in \mathbb{N}$.
3. Show that $52^{480} \equiv 1 \ (mod\ 105)$.

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

1. Show that $f: \mathbb{R} \to \mathbb{R}$, given by $f(x) = 2x + 5$, is bijection and hence find its inverse.
2. In $\mathbb{Z}$, define a binary operation * as ,For $a, b \in \mathbb{Z}$, $a * b = a + b - ab$.

   Show that * satisfies all the properties of binary operation.

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

1. Any two equivalence classes of X are either disjoint or identical.
2. $a * b = 4a - 5b$, for $a, b \in \mathbb{Z}$. Test whether given binary operation is commutative and assosciative.
3. Show that $f: \mathbb{R} - \{3\} \to \mathbb{R} - \{0\}$, given by $f(x) = \frac{1}{x-3}$, is bijection.

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

1. State and prove Remainder theorem.
2. Define Irreducible polynomial and show that if $p(x)$ is an irreducible polynomial such that $p(x) | a(x)b(x)$, for $a(x), b(x) \in \mathbb{R}[x]$ then $p(x) | a(x)$ or $p(x) | b(x)$.

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

1. Find the quotient and remainder when $x^4 - 3x^2 + 4x + 8$ is divided by $x^2 + 2$.
2. Find g.c.d. of the polynomials $f(x) = x^8 - 1, g(x) = x^6 - 1$ over R[x].

3. Find Multiplicity of each root of $f(x) = 4x^3 + 4x^2 - x - 1$.

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

1. Show that for $n \in \mathbb{N}$, 8 divides $3^{2n} - 1$.
2. Calculate $\emptyset(5040)$.
3. If $\sim$ is an equivalence relation on a non-empty set X, then union of equivalence classes is X.
4. Show that $f: \mathbb{R} \to \mathbb{R}$, given by $f(x) = 5x - 8$, is bijection.
5. Prove that for $n \geq 4$, $2^n < n!$.

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D. B. J. College, Chiplun

Semester-I ATKT (CBCS) Examination March 2025

Class: F.Y.B.Sc. **Subject: Chemistry** Paper: I

Date: 04/03/2025 Time: 12.30 pm to 3.00 pm Max. Marks: 75

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

Q.1 A Select the correct option and complete the following sentences. 9
(Attempt any nine)

i) Which of the following is an intensive property?
a) Density b) Mass c) Free Energy

ii) In isobaric process,.....of system remains constant.
a) Temperature b) Pressure c) Volume

iii) Basicity of phosphoric acid is.....
a) one b) two c) three

iv) 25 gram KCl in 100 mL solution represents.....
a) 25% w/w KCl b) 25% v/v KCl c) 25% w/v KCl

v) 2s orbital has ..... radial nodes.
a) 1 b) 2 c) 3

vi) The shape of p-orbital is .....
a) helical b) spherical c) dumbbell

vii) In ground state of atom electron occupies .....energy orbital available to them.
a) highest b) lowest c) middle

viii) The subshell with *l* value zero is designated as .....
a) s b) p c) d

ix) The prefix for keto group is used as .....in IUPAC nomenclature.
a) Carbo b) Keto c) Oxo

x) Percentage of p-character in sp^3 hybridized carbon is .....
a) 50 b) 75 c) 25

xi) The H-C-C bond angle in acetylene molecule is .....
a) 120^0 b) $109^028'$ c) 180^0

xii) Select correct stability order of alkyl carbocations.
a) Methyl > Primary > Tertiary > Secondary
b) Tertiary > Primary > Secondary > Methyl
c) Tertiary > Secondary > Primary > Methyl

xiii) Which of the following compound has zero dipole moment?
a) Chloroform b) Methyl Chloride c) Carbon tetrachloride

B State whether the following sentences are **true** or **false.** (**Attempt any three**) 3

i) When $\Delta H = 0$, it is called isoenthalpic process.

ii) Molality is independent of temperature.

iii) Splitting of spectral lines under the influence of electric field is called Zeeman effect.

iv) There are 12 groups in modern periodic table.

v) Sigma bonds are stronger than pi-bonds.

vi) Chloroform is non-polar molecule.

C Match the following (**Attempt any three**) 3

1) State function	a) Alkali metal
2) Proton	b) Negative charge
3) Potassium	c) Work
4) Nitrile	d) Neutral
5) Nucleophile	e) R-CN
	f) R-OH
	g) Positive charge
	h) Volume

Q.2 Attempt **any four** of the following 20

A Explain the terms- i) Internal Energy ii) Resonance energy

B State first law of thermodynamics in different ways.

C A gas expanding against a constant pressure of 2 atm. from 10 to 20 litres absorbs 300 calories of heat. What is change in internal energy?

D Derive relation between C_p and C_v.

E Define Molarity.
Calculate normality of solution which contains 60 g NaOH dissolved in 3L water. (Atomic Weight of Na = 23, O = 16, H = 1)

F Define mole fraction.
10 g of glucose (Mol. Wt. 180) was dissolved in 250 g water. Calculate mole fraction of each component.

Q.3 Attempt **any four** of the following 20

A Explain Rutherford's α-scattering experiment.

B Explain Bohr's atomic model. What are its limitations? (Write any 2)

C Write comphrensive note on Quantum Numbers.

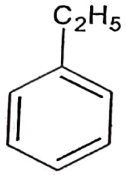
D What is meant by atomic radius? How does it vary in periodic table?

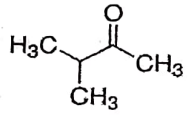
E Explain the term Effective Nuclear charge and calculate Zeff for 2p electron in nitrogen.

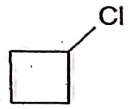
F What is electronegativity?
Calculate the electronegativity value of chlorine atom. Given that ionization energy of Cl atom is 13.0 eV and Electron affinity of Cl atom is 4.0 eV.

Q.4 Attempt **any four** of the following 20

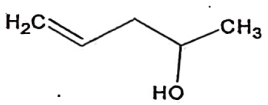
A i) Give IUPAC names for the following compounds.

a) 

b) 

c) 

d) 

e) 

B i) Explain the sp^3 hybridization of carbon with suitable example.
ii) Draw the structures of the following compounds and mention the state of hybridization of each carbon and oxygen.
a) Acetamide b) Formaldehyde

C i) What is carbanion? Explain the structure and shape of carbanion.
ii) Discuss the stability of carbocation on the basis of inductive effect.

D Explain following reactions with one example each.
i) Addition reaction ii) Substitution reaction.

E i) What are free radicals? How do they form?
ii) Explain the stability of free radicals on the basis of resonance.

F Write the structural formula for each of the following compounds.
a) 2-bromo-3-chloropentane b) Cyclohexene c) 2-nitropropane
d) Methyl ethanoate e) Pentan-2-ol

D. B. J. College, Chiplun

Semester-I ATKT (CBCS) Examination March 2025

Class: F.Y.B.Sc. **Subject: Chemistry** **Paper: II**

Date: 05/03/2025 Time: 12.30 pm to 03.00 pm Max. Marks: 75

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

Q.1 A Select the correct option and complete the following sentences. 9
(Attempt any nine)

i) Which of the following is a rate law for second order reaction?
a) Rate = $k[A]^2[B]^2$ b) Rate = $k[A][B]^2$ c) Rate = $k[A][B]$

ii) Acid catalyzed hydrolysis of methyl acetate is …… reaction.
a) zero order b) pseudo first order c) second order

iii) Surface tension of liquid ….. with increase in temperature.
a) decreases b) increases c) remains same

iv) Molar refraction is product of specific refraction and …..
a) molar mass b) boiling point c) melting point

v) Oxidation state of sulfur in H_2SO_4 is ……
a) +6 b) +5 c) -5

vi) The tendency of an element to form a long chain of same atom is called
a) Catenation b) Chain Formation c) Metallation

vii) The s and p block elements are collectively known as……. elements.
a) Transition b) Inner transition c) Main group

viii) ……..is most electronegative element in periodic table.
a) Fluorine b) Chlorine c) Hydrogen

ix) In flying-wedge formula, a solid wedge represents a bond projecting…..
a) above the plane of the paper b) below the plane of the paper
c) in the plane of the paper

x) The optical rotation is measured by …….
a) Viscometer b) Stalagmometer c) Polarimeter

xi) According to CIP rules the correct priority order of the following is……
a) Br > F > Cl > H b) Br > Cl > F > H c) Br > F > H > Cl

xii) ……..conformation of ethane has maximum energy.
a) Skew b) Staggered c) Eclipsed

xiii) The two similar groups on same side of the double bond the isomer is called ……form.
a) cis b) erythro c) trans

B State whether the following sentences are **true** or **false.** 3
(Attempt any three)

i) During kinetic study of chemical reactions, temperature is maintained constant.
ii) Liquid crystal is intermediate state between solid and liquid state.
iii) CO produces toxic effects on human beings due to its reversible reaction with haemoglobin in the blood.
iv) Sodium bicarbonate is aerating agent.
v) Fischer projection formula represents staggered conformation.
vi) Geometrical isomers are also called diastereomers.

C Match the following (**Attempt any three**) 3

i)	$k = Ae^{-Ea/RT}$	a) Fullerene
ii)	CFC	b) Staggered form
iii)	Bucky ball	c) Arrhenius equation
iv)	Antiperiplanar	d) Chloroflurocarbon
v)	'd' isomer	e) Kirchhoff's equation
		f) Positive sign
		g) Negative sign

Q.2 Attempt **any four** of the following 20

A Derive integrated rate equation for first order reaction.
B Name the methods used to determine order of reaction. Explain any one in detail.
C What is second order reaction?
A second order reaction with a = b, is 25 % complete in 70 min. Calculate the time taken for 60% completion of reaction.
D Define viscosity. Explain the factors which affect viscosity.
E In stalagmometer method, two liquids A and B formed 40 and 60 drops for a given volume. If the densities of A and B are 0.85×10^3 kg/m^3 and 1×10^3 kg/m^3 respectively and the surface tension of B is 0.07 Nm^{-1}. Calculate surface tension of liquid A.
F What are liquid crystals? Give any four applications of liquid crystals.

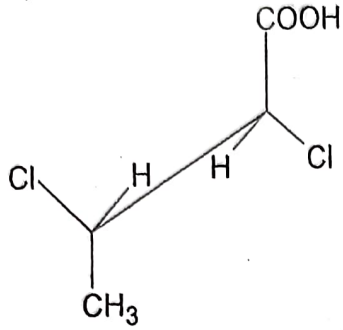
Q.3 Attempt **any four** of the following 20

A What is diagonal relationship between elements? Explain it with respect to beryllium and aluminium.
B Describe the metallic and non-metallic character and explain variation in periodic table.
C How does Nitrogen differ from other group 15 elements?
D Write short note on Acid Rain.
E Name any two oxides of carbon.
Write any two sources and control measures for each oxides of carbon.
F Give important applications of quicklime.

Q.4 Attempt **any four** of the following 20

A i) Draw Fischer projection formulae and Newman projection formulae of threo-tartaric acid.

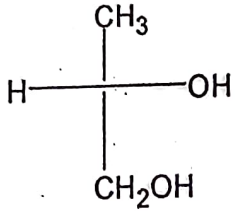
ii) Convert the following structure to Fischer projection.



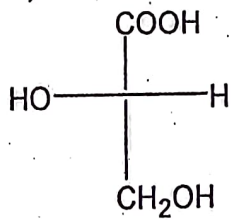
B i) What is stereoisomerism? Explain optical isomerism with suitable examples.

ii) Assign 'D' or 'L' configuration to the following compounds.

a)

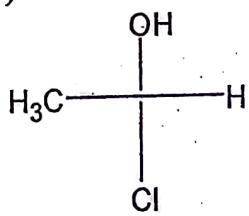


b)

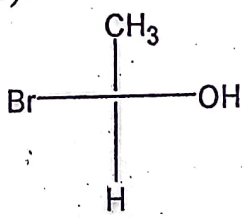


C Assign the configuration 'R' or 'S' to the following molecules by mentioning the priority of substituents.

a)



b)



D Explain the following terms with suitable examples.

i) Diastereoisomers ii) Meso isomers

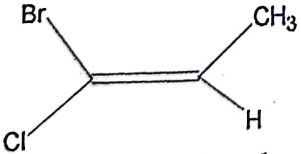
Write any two characteristics of enantiomers.

E i) What is optical activity? Which of the following compounds are optically active or inactive? Justify your answer.

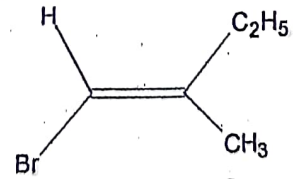
a) 1-Bromo-2-methylbutane b) 2-Bromobutane

ii) Assign Z-E descriptors to the following compounds.

a)



b)



F What is conformational analysis? Draw the conformations of ethane. Discuss their relative stabilities.

D. B. J. College, Chiplun.

Semester – I ATKT Examination March - 2025

Class: – F. Y. B. Sc. PHYSICS – I

Date: - 06/ 03 / 2025 **Time: 12:30 pm to 3:00 pm** **[Marks: 75]**

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

Q. 1 (A) Attempt ANY ONE. **10**

(i) Explain with an example, the steps in solving problems using Newton's laws.

(ii) A cricket ball of mass ***350 gm*** is moving with a velocity of ***14 ms^{-1}*** and is hit by a bat so that the ball is turned back with a velocity of ***24 ms^{-1}***. The force of the bat acts for ***0.035 s***. Find the average force exerted by the bat.

(B) Attempt ANY TWO. **10**

(i) Two blocks of masses ***10 kg*** and ***8 kg*** are connected by a light string which passes over a smooth pulley. Calculate the acceleration of each mass and the tension in the string.

(ii) A wooden block of mass '***m***' is placed on an inclined plane of an angle 'θ'. The angle 'θ' is adjusted in such a way that the block moves downward with constant speed. Determine the angle 'θ' in terms of coefficient of friction.

(iii) What are conservative and non-conservative forces? Show that gravitational force is conservative force.

(iv) A woman ***500 N*** stands up on a scale containing stiff spring. In equilibrium the spring is compressed by ***1 cm*** under her weight. Find the force constant of the spring and the total work done on it during compression.

Q. 2 (A) Attempt ANY ONE. **10**

(i) Show that for a homogeneous isotropic material $Y = 3K(1 - 2\sigma)$.

(ii) Explain '***Venturimeter***' asanapplication of Bernoulli's theoremfor the measurement of rate of discharge of fluid flow.

(B) Attempt ANY TWO. **10**

(i) A horizontal pipe has non-uniform cross-sectional area. At certain point the velocity of flow in this pipe is ***0.35 m/s*** at pressure ***2 cm*** of mercury. Calculate the pressure at some other point where the velocity is ***0.67 m/s***.

(ii) For isotropic homogeneous material, show that; $\frac{9}{Y} = \frac{1}{K} + \frac{3}{\eta}$.

(iii) State and explain ***Stoke's law*** for a falling sphere through the fluid.

Q. 2 (B) (iv) Calculate the rate of flow of water through the horizontally kept capillary tube of length ***100 cm*** and internal diameter of ***1 mm***, under pressure of a water column

of water *40 cm* in height. (viscosity of water = 10^{-3} Ns/m^2)

Q. 3 (A) Attempt ANY ONE.

(i) Derive an expression for the work done by a perfect gas in an adiabatic change. Hence show that; $W = C_v (T_1 - T_2)$.

(ii) Derive an expression for the efficiency of ***Carnot's engine.***

Q.3 (B) Attempt ANY TWO.

(i) Find the equation of the curve passing through maxima and minima of ***Van der Waal's*** isothermals.

(ii) The critical volume of hydrogen is *37.6 cc/g*. Calculate the molecular diameter of hydrogen. $N = 6.023 \times 10^{23}$ *per mole.*

(iii) An ideal gas of volume *1.0 L* is compressed adiabatically to $\left(\frac{1}{15}\right)^{th}$ of its initial volume. At 27^oC its initial pressure is 1.01×10^5 *Pa*. Calculate,**(i)**Final pressure and **(ii)**Final temperature. (For ideal gas $\gamma = 1.4$).

(iv) Explain the concept of heat.

Q. 4 Attempt ANY THREE. **15**

(i) A block of mass '*M*' is pulled up an inclined plane by applying a force '*F*' making an angle 'β' to the horizontal. If the coefficient of friction is '*tan* φ' and the angle of inclination is 'θ', Show that $F = \frac{Mg\sin(\theta+\varphi)}{\cos(\beta-\varphi)}$. What is the minimum value of '*F*' for the angle θ?

(ii) A block slides down an incline plane of angle '37^0' with an acceleration of *0.3* times the acceleration due to gravity '*g*'. Find the coefficient of kinetic friction.

(iii) Derive equation of continuity for a fluid flow.

(iv) A metal wire of length '*l*' and radius '*r*' is stretched. Assuming that the volume of the wire is unchanged, show that Poisson's ratio of the material is *0.5*.

(v) A reversible Carnot cycle does work of *150 KJ/cycle*. At *227* ^oC, the heat supplied by cycle is *225 KJ/cycle*. Calculate the temperature at which heat is rejected, and thermal efficiency of engine.

(vi) In a double acting steam engine, the average pressure of steam is 1.2×10^5 Nm^{-2}. The length of a stroke is *1 m* and the area of the piston is *0.15* m^2. Find the power of the engine if it makes *4* strokes per second.

*****

Duration: 3 hours Marks: 100

Please check whether you have got the right question paper.

1. All questions are compulsory.
2. All questions have internal choices.
3. Use of simple calculator is permitted.
4. Figures to the right indicate full marks.
5. Draw neat diagrams wherever necessary.

Q1(A) Select the correct answer from the given options and rewrite the statements.(Any 10) (10)

1. Demand forecasting is an estimate of the _____ demand.
   a) Past b) future c) present d) none of the above
2. Demand is relatively elastic when_____.
   a) Ed =1 b) Ed=0 c) Ed>1 d) Ed< 1.
3. Opportunity cost is also called as _____ cost.
   a) Total b) average c) marginal d) alternative
4. Ratio of a percentage change in quantity demanded and percentage change in income is called _____.
   a) income elasticity of demand b) price elasticity of demand
   c) price elasticity of supply d) elasticity of substitution.
5. Replacement cost is incurred to replace _____.
   a) workers b) raw material c) the capital d) none of the above
6. A linear iso-quant indicates _____.
   a) continuous substitutability of factors b) perfect substitutability of factors
   c) limited substitutability of factors d) zero substitutability of factors.
7. Short run production function includes _____.
   a) only fixed factors b) only variable factors
   c) both fixed and variable factors d) none of these
8. _____ is an example of internal economies of scale.
   a) labour economies b) technical economies
   c) managerial economies d) all of the above
9. Demand curve is_____.
   a) horizontal b) vertical c) upward sloping d) Downward sloping
10. When total product is maximum, marginal product is _____.
    a) Zero b) Negative c) Maximum d) Constant
11. Which of the following properties of an isoquant is due to diminishing marginal rate of technical substitution?
    a) Negative slope b) concave to the origin
    c) Straight line d) Convex to origin
12. Which of the following curve is used to derive planning curve?
    a) short run average cost b) Short run marginal cost
    c) Long run average cost d) Long run marginal cost

Q1(B) Write whether the following statements are true or false (Any 10) (10)

1. Monopoly firm faces an upward sloping demand curve.
2. Income elasticity of demand for normal good is positive.
3. Habits make demand for good inelastic.
4. Higher iso-quant shows higher level of output.
5. Demand for a commodity only depends on price of the commodity.
6. Cross elasticity of demand is calculated for two unrelated products.
7. Total variable cost curve is inverse S shaped curve.
8. A large firm can enjoy marketing economies.
9. In the short run all costs are fixed.
10. Demand curve under monopoly is perfectly inelastic.
11. Two iso-quant curves intersect each other.
12. Macroeconomics is a microscopic study of the economy.

Q2 Attempt A and B OR C and D

(A) Explain changes in market equilibrium due to change in demand. (07)

(B) Discuss opportunity cost and marginal principal concept in business economics. (08)

OR

(C) Explain how concepts of micro economics are used in business decisions. (07)

(D) Complete the following table and calculate TR, AR and MR. (08)

Output	1	2	3	4	5	6	7
Price (Rs)	40	40	40	40	40	40	40
TR							
AR							
MR							

Q3 Attempt A and B OR C and D

(A) Discuss the factors affecting price elasticity of demand. **(07)**

(B) Explain total outlay method of measuring price elasticity of demand. **(08)**

OR

(C) When price is 10 Rs. quantity demanded is 100 units. When price increase to 8 Rs. quantity demanded is 60 units. **(07)**

i) Calculate price elasticity of demand.

ii) Is demand elastic or inelastic?

(D) Explain the types of demand forecasting. **(08)**

Q.4 Attempt A and B OR C and D

(A) Explain the law of variable proportion. **(07)**

(B) Discuss external economies and diseconomies of scale. **(08)**

OR

(C) What is the producer's equilibrium? Explain with diagram. **(07)**

(D) Define Isoquant and explain properties of isoquant. **(08)**

Q5. Attempt A and B or C and D

(A) What is learning curve? Explain with diagram. **(07)**

(B) Explain the behavior of short run average cost curves. **(08)**

OR

(C) Complete the following table and calculate TFC, TVC, AFC, AVC & AC. **(08)**

Quantity	0	1	2	3	4	5
TC (Rs.)	40	60	80	100	128	200
TFC						
TVC						
AFC						
AVC						
AC						

(D) What is cost? Explain sunk cost and social cost. **(07)**

Q6 Attempt A and B OR Short notes (any 4)

(A) Define income elasticity of demand. Explain the types of income elasticity of demand. **(10)**

(B) Explain the concept of breakeven point with example and diagram. **(10)**

OR

Short notes (Any 4) **(20)**

i) Promotional elasticity of demand

ii) Variables and equations

iii) Survey method of demand forecasting

iv) Individual demand schedule

v) Fixed cost and variable cost

vi) Limitations of Breakeven analysis.

date – 04/03/2026
Time – 12.30 pm to 3.30 pm

Time: 3 Hrs

Marks : 100

Note: 1. All questions are compulsory
2. Figures to the right indicate full marks

Q.1 A) Fill in the blanks with appropriate answers (Any 10) (10)

1. _____ is an external growth strategy.
(Product development, Market development, Market Expansion, Merger)
2. _____objectives are also known as three fold objectives.
(Organic, Social, Economic, Human)
3. _____ refers to reorganization of the business.
(Liberalization, globalization, privatization, restructuring)
4. _____ environment is concerned with different aspects of population.
(Demographic, Sociographic, Cultural, Political)
5. _____ is a trading block consisting of North American countries.
(NAFTA, ASEAN, SAARC, OPEC)
6. The _____ agreement of WTO pertains to patents and copyrights.
(TRIPs, TRIMs, GATT, GATS)
7. Business units dealing in hotels, food and drugs need to obtain _____ license.
(FHA, FCA, FDA, FAD)
8. _____ is an economic factor contributing to the growth of entrepreneurship.
(Increase in Demand, Quality of product, social support, Employees complaints)
9. An entrepreneur exploits change in to _____. (opportunity, threat, strength, weakness)
10. _____ is a government initiative to promote a business unit.
(Tax holiday, GST, Surcharge, Education Cess)
11. _____entrepreneur exist within an organization.
(Intrapreneur, manager, Deputy Manager, leader)
12. Feasibility report is prepared _____ feasibility studies.
(alongwith, after, before, never)

Q.1B) State whether following statements are true or false. (Any 10) (10)

1. Business is a socio-economic activity.
2. Objectives can never be expressed in quantitative terms.
3. Satisfying shareholders is a social objective.
4. Seed capital scheme is an incentive provided to entrepreneurs in India.
5. Project report is prepared after conducting feasibility study.
6. Promoter is an originator of the idea for formation of the business.
7. Supplier is macro external environmental factor affecting business.
8. Pakistan is a member of OPEC.
9. Air India is an example of privatization.
10. Market feasibility study shows whether or not needed technology exist.
11. TAN is mandatory for opening of Bank account.
12. All promoters are entrepreneurs but all entrepreneurs are not promoters.

(15)

Q.2 Answer any two of the following

a) Define business. Explain its features.
b) State in brief national objectives of business.
c) What is privatisation? Explain its impact on Indian economy.

(15)

Q.3 Answer any two of the following

a) What is business environment? Explain its features.
b) How is educational environment in India? Explain its impact on business.
c) Discuss the role of trading blocs in international trade.

(15)

Q.4 Answer any two of the following

a) What is project planning? Explain its importance to business.
b) Explain the factors determining the location of a business unit
c) Explain legal provisions relating to licensing and registration of business unit.

(15)

Q.5 Answer any two of the following

a) State the importance of entrepreneurship in detail.
b) What are the competencies required for a successful entrepreneur?
c) Explain the various problems faced by women entrepreneurs in India.

Q.6) Write notes on: (Any 4) (20

a) Turnaround strategy
b) WTO
c) Interrelationship between business and environment
d) Types of Entrepreneur
e) Business planning process
f) Feasibility Study

वेळ: 3 तास

गुण : १००

सूचना : 1. सर्व प्रश्न अनिवार्य आहेत.
2. उजवीकडील अंक पूर्ण गुण दर्शवितात.
३. इंग्रजी प्रश्नपत्रिका मूळ मानवी.

प्र. १ अ खालील दिलेल्या पर्यायांमधून योग्य पर्याय निवडा: (कोणतेही १०) (१०)

१. _____ हे बहिर्गत वृद्धी धोरणाचे उदाहरण आहे.
(वस्तु विकास, बाजारपेठ विकास, बाजारपेठ विस्तारीकरण, विलीनीकरण)

२. _____उद्दिष्टे ही तीन घडीची उद्दिष्टे म्हणून ओळखली जातात.
(सेंद्रिय, सामाजिक, आर्थिक, मानवी)

३. _____ म्हणजे व्यवसायाची पुर्नरचना होय.
(उदारीकरण, जागतिकीकरण, खाजगीकरण, पुर्नबांधणी)

४. _____ पर्यावरण, लोकसंख्येच्या विविध बाबींशी निगडीत असते.
(लोकसंख्याशास्त्रीय, समाजशास्त्रीय, सांस्कृतिक, राजकीय)

५. _____ व्यापारी गटामध्ये उत्तर अमेरिकी देशांचा समावेश होतो.
(NAFTA, ASEAN, SAARC, OPEC)

६. WTO च्या _____ करारामध्ये, पेटंटस आणि कॉपीराईटसचा समावेश होतो.
(TRIPs, TRIMs, GATT, GATS)

७. हॉटेल, अन्न आणि औषधांशी निगडीत व्यवसाय एककांना _____ परवाना मिळविणे गरजेचे आहे.
(FHA, FCA, FDA, FAD)

८. _____ हा उद्योजकतेच्या वाढीमध्ये योगदान देणारा आर्थिक घटक आहे.
(मागणीमधील वाढ, वस्तूचा दर्जा, सामाजिक पाठींबा, कर्मचारी तक्रार)

९. उद्योजक पिळवणूकीचे रूपांतर _____ मध्ये करतो.
(संधी, धोका, ताकद, दुर्बलता)

१०. _____ हा व्यवसाय एककाच्या वृद्धीसाठी सरकारने घेतलेला उपक्रम आहे.
(कर सुट्टी, GST, अधिभार, शैक्षणिक भार)

११. _____ उद्योजक संस्थेच्या आतच अस्तित्वात असतो.
(अंतर्गत उद्योजक, व्यवस्थापक, उपव्यवस्थापक, नेता)

१२. व्यवहार्यता अभ्यासा _____ व्यवहार्यता अहवाल तयार केला जातो.
(बरोबरीने, नंतर, आधी, कधीच नाही)

(ब) खालील विधाने सत्य किंवा असत्य ते सांगा. (कोणतेही १०) (१०)

१. व्यवसाय हा आर्थिक-सामाजिक उपक्रम आहे.

२. उद्दिष्टे कधीच संख्यात्मक स्वरुपात व्यक्त करता येत नाही.

३. भागधारकांना सामोरी जावे हे सामाजिक उद्दिष्ट आहे
४. बीज भांडवल योजना भारतातील उद्योजकांना प्रोत्साहन देते.
५. व्यवहार्यता अभ्यास झाल्यानंतर प्रकल्प अहवाल तयार केला जातो.
६. प्रवर्तक हा व्यवसाय स्थापनेच्या कल्पनेचा मूळ व्यक्ती असतो.
७. पुरवठादार हा व्यवसायावर परिणाम करणारा बाह्य पर्यावरणाच स्थूल घटक आहे.
८. पाकिस्तान हा ओपेक गटाचा सदस्य आहे.
९. एअर इंडिया हे खाजगीकरणाचे उदाहरण आहे.
१०. बाजारपेठ व्यवहार्यता अभ्यास हा गरजेचे तंत्रज्ञान अस्तित्वात आहे की नाही हे दर्शवितो.
११. बँकेत खाते उघडण्यासाठी TAN अनिवार्य आहे.
१२. सर्व प्रवर्तक हे उद्योजक असतात पण सर्व उद्योजक हे प्रवर्तक नसतात.

(१५)

प्र २. खालीलपैकी कोणत्याही दोहोंची उत्तरे द्या.

अ) व्यवसायाची व्याख्या द्या. त्याची वैशिष्टे स्पष्ट करा.
ब) व्यवसायाची राष्ट्रीय उद्दिष्टे थोडक्यात सांगा.
क) खाजगीकरण म्हणजे काय? त्याचा अर्थव्यवस्थेवरील परिणाम स्पष्ट करा.

(१५)

प्र ३. खालीलपैकी कोणत्याही दोहोंची उत्तरे द्या.

अ) व्यवसायिक पर्यावरण म्हणजे काय? त्याची वैशिष्टे स्पष्ट करा.
ब) भारतातील शैक्षणिक पर्यावरण कसे आहे? त्याचा व्यवसायावरील परिणाम स्पष्ट करा.
क) आंतरराष्ट्रीय व्यापारातील व्यापारी गटाच्या भूमिकेवर चर्चा करा.

(१५)

प्र ४. खालीलपैकी कोणत्याही दोहोंची उत्तरे द्या.

अ) प्रकल्प नियोजन म्हणजे काय? त्याचे व्यवसायास असणारे महत्त्व स्पष्ट करा.
ब) व्यवसाय एककाचे स्थान निश्चित करतानाचे घटक स्पष्ट करा.
क) व्यवसाय एककाच्या परवानगी आणि नोंदणीशी संबंधित कायदेशीर तरतुदी स्पष्ट करा.

(१५)

प्र ५. खालीलपैकी कोणत्याही दोहोंची उत्तरे द्या.

अ) उद्योजकतेचे महत्व थोडक्यात सांगा.
ब) यशस्वी उद्योजकांस आवश्यक असणाऱ्या क्षमता कोणत्या आहेत?
क) भारतातील महिला उद्योजकांना सामोरी जावी लागणारी विविध आव्हाने कोणती आहेत?

(२०)

प्र .६ थोडक्यात टीपा लिहा (कोणत्याही ४)

अ) पुर्ननफा स्थिती
ब) WTO
क) व्यवसाय आणि पर्यावरण यांच्यातील आंतरसंबंध
ड) उद्योजकांचे प्रकार
ई) व्यवसाय नियोजन प्रक्रिया
फ) व्यवहार्यता अभ्यास