

S. S. DEMPO COLLEGE OF COMMERCE AND ECONOMICS
ALTINHO, PANAJI – GOA
Semester I Examination, October – 2016
MATHEMATICAL TECHNIQUES
(New Course)

Duration: 2 Hours

Marks: 80

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

Q.1. Answer the following. (5X4=20)

- If the 7th and 12th terms of an A.P. (Arithmetic Progression) are 20 and 35 respectively, find the first term and common difference.
- Construct the truth table for $(\sim p \wedge q) \leftrightarrow \sim(q \rightarrow r)$.
- A, B and C invested ₹ 50,000, ₹ 40,000 and ₹ 90,000 respectively in a business. At the end of the year, A received ₹ 8000 as his share in the profit. Find the total profit. Also find B's and C's share in the profit.
- Solve the following equations using determinants.
$$x - y - z = 7, x + 2y + z = 15, z + 4y - x + 1 = 0$$

OR

Q.I. Answer the following. (5X4=20)

- The sum of three numbers in an A.P. (Arithmetic Progression) is 24 and the sum of their squares is 224. Find the numbers.
- Suppose that the statements p, q, r, s, t are assigned truth values T, F, T, F, F respectively, find the truth values of each of the following.
i) $\sim(r \wedge t) \rightarrow (s \leftrightarrow \sim q)$ ii) $(s \vee p) \leftrightarrow [(\sim r \rightarrow q) \wedge t]$
- A, B and C are partners in a business. A's and B's capitals are in the ratio 5:4 and B's and C's capitals are in the ratio 3:1. At the end of the year, the profit is ₹ 62,000. How should it be distributed among the three partners?

z) Find x and y if

$$\frac{1}{x-1} + \frac{3}{y+2} + 5 = 0$$

$$\frac{6}{x-1} + \frac{5}{y+2} - 9 = 0$$

Q.2. Answer the following.

(5X4=20)

- a) If $X = \{x / x \in N, x \text{ is odd and } 4 < x < 25\}$ is the universal set. $A = \{7, 11, 19, 21\}$ and $B = \{9, 11, 17, 23\}$, verify that $(A \cup B)' = A' \cap B'$.
- b) Find three numbers in G.P. (Geometric Progression) such that their product is 64 and whose sum is 14.
- c) If $A = \begin{bmatrix} 1 & -1 \\ -3 & 2 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 & 2 \\ 0 & -1 & -3 \end{bmatrix}$, find $|AB|$.
- d) How many different words can be formed with the letters of the word "FORMAT"? In how many of these O and A are together? How many of these begin with O and end with A?

OR

Q. II. Answer the following.

(5X4=20)

- w) Let A = Set of letters of the word "people"
 B = Set of letters of the word "society"
 C = Set of letters of the word "religion"
Verify that $A \cap (B - C) = (A \cap B) - (A \cap C)$.
- x) If the 7th and 4th terms of a G.P. (Geometric Progression) are 192 and 24 respectively, find its first term and common ratio.
- y) If $A = \begin{bmatrix} 2 & -1 & 1 \\ -2 & 3 & -2 \\ -4 & 4 & -3 \end{bmatrix}$, show that $A^2 = A$.

- z) There are 5 books on Fiction, 4 on Non-fiction and 3 on Detective stories. In how many ways can the books be arranged so that the books of the same type are together?

Q.3. Answer the following.

(5X4=20)

- a) Test the validity of the following argument.
 "If Mary goes to college, then she carries her books. Mary did not carry her books. Therefore Mary did not go to college."
- b) Find n, if ${}^nC_4 = 5 \times {}^nC_3$
- c) What number must be added to each of the numbers 6, 15, 20 and 43 to make them proportional?
- d) If $A = \begin{bmatrix} 3 & -2 \\ 0 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 1 \\ -4 & 3 \end{bmatrix}$, find the matrix X such that $2X + 3A - 4B = 0$.

OR

Q. III. Answer the following.

(5X4=20)

- w) A survey of 85 students asked them about the subjects they liked to study. 35 students liked math, 37 liked history, and 26 liked physics. 20 liked math and history, 14 liked math and physics, and 3 liked history and physics. 2 students liked all three subjects. i) How many of these students like math or physics? ii) How many of these students didn't like any of the three subjects?

x) Find n, if ${}^nP_6 = 56 \times {}^{n-2}P_4$

y) If $2x - 1, 5x - 6, 6x + 2$ and $15x - 9$ are in proportion, find the value of x.

z) If $A = \begin{bmatrix} 4 & 2 \\ -2 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 6 \\ -6 & 3 \end{bmatrix}$, show that $(A + B)(A - B) = A^2 - B^2$

Q.4. Answer the following.

(5X4=20)

- a) Show that the matrix $A = \begin{bmatrix} 1 & 3 \\ 0 & 3 \end{bmatrix}$ satisfies the matrix $A^2 - 4A + 3I = 0$.
- b) Find the sum of $2 + 22 + 222 + \dots$ to n terms.
- c) If the net selling price of a chair is ₹ 5,700 after allowing 25% trade discount and thereafter 5% cash discount, determine the market price.
- d) In a group of 17 students, 9 have offered accountancy and 8 offered costing. In how many ways can a committee of 6 students be formed so that it will have a majority of students offering accountancy?

OR**Q. IV. Answer the following.**

(5X4=20)

- w) If $A = \begin{bmatrix} 2 & 3 & 4 \\ k & -2 & 7 \\ 8 & -5 & 3 \end{bmatrix}$ is a singular matrix, find k.
- x) A person wants to purchase a motor cycle. He has two alternatives for the payment. It costs ₹ 60,000 if full payment is made at the time of purchase. Other alternative is to pay the cost in 5 years by monthly instalment, starting with ₹ 500 in the first month and increasing the value of the instalment by ₹ 10 every succeeding month. What is the extra payment in the instalment scheme?
- y) Ashok purchased a car marked at ₹ 5,36,500 at a discount of 8%. If the sales tax is charged at 10%, find the amount Ashok paid for the car.
- z) Out of 4 officers and 10 clerks in an office, a committee consisting of 2 officers and 3 clerks is to be formed. In how many ways can this be done if i) any officer and any clerk can be included ii) one particular clerk cannot be on the committee.