



॥ विद्या सर्वस्य भूषणम् ॥

PRABODHAN EDUCATION SOCIETY'S

Vidya Prabodhini College of Commerce, Education, Computer & Management  
Vidyanagar, Alto-Parvuri, Goa

**SEMESTER END EXAMINATION - OCTOBER/NOVEMBER 2017 (Repeat)**

**Sub: MATHEMATICAL TECHNIQUES - I**

**Semester: I**

**M. Marks: 80**

**M. Time: 2 hrs.**

INSTRUCTIONS: 1. All questions are compulsory however internal choice is available.

2. Use of calculator is strictly forbidden.

3. Figures to the right indicate marks allotted.

4. There are 4 main questions each carrying 20 marks.

5. You may answer randomly but every main question attempted should be answered serially.

**Q1. Attempt the following.**

**(4 x 5 = 20)**

- Construct the truth tables for  $\sim q \rightarrow [(p \wedge q) \wedge p]$  and  $(p \leftrightarrow \sim q) \rightarrow (q \leftrightarrow \sim p)$ .
- If  $5({}^n P_4) = 3({}^{n+1} P_4)$ , then find n.
- If the 8<sup>th</sup> term of an A.P is 19 and its 16<sup>th</sup> term is 35, find its nth term.
- If  $2 \begin{bmatrix} 5 & 2 \\ -3 & 4 \end{bmatrix} + 3 \begin{bmatrix} 1 & 0 \\ 4 & -4 \end{bmatrix} - 2X = 0$ , find the matrix X.

**OR**

**Q1. Attempt the following.**

**(4 x 5 = 20)**

- Examine whether the statement " $[(p \rightarrow \sim q) \vee (\sim p)] \leftrightarrow q$ " is tautology, contradiction or neither.
- A council consist of 10 members, 6 belonging to party A and 4 belong to party B. In how many ways can a committee of 5 be formed so that the members of the party B are in majority?
- Is the series -3, 1, 5, 9, ..... an A.P? If yes, then find its n<sup>th</sup> term  $T_n$  and also find  $S_{12}$ .
- For what matrix D, the equation  $2A - 3B + C - D = 0$  is true, where

$$A = \begin{bmatrix} 1 & 7 \\ 3 & -1 \\ -3 & 2 \end{bmatrix}, \quad B = \begin{bmatrix} 0 & 1 \\ 5 & -4 \\ 2 & -5 \end{bmatrix}, \quad C = \begin{bmatrix} 0 & 5 \\ -3 & 2 \\ 2 & 1 \end{bmatrix}$$

**Q2. Attempt the following.**

**(4 x 5 = 20)**

- In a consumer-preference survey of an item, 15 were found to use Brand A, 20 were found to use Brand B, 5 were found to be in the habit of using both brands A and B. Find the number of consumers using at least one of the two brands of the item.

- b) A student council committee of 4 is to be selected from 7 COMMERCE students and 6 BABED students. In how many ways can this be done so that at least 2 students from BABED are in the committee?

c) Find  $\begin{vmatrix} 4 & 4 & 1 \\ 3 & 6 & -1 \\ -1 & -5 & 2 \end{vmatrix}$ .

- d) A person repays his interest-free loan from a friend in 15 monthly installments, such that, each installment is less than the previous installment by ₹ 100. If the first installment was ₹ 2000, find out his last installment, and calculate his loan amount.

OR

QII. Attempt the following.

(4 x 5 = 20)

- p) If  $A = \{1, 2, 4, 5, 6\}$  and  $B = \{2, 4, 6, 8, 9\}$  are subsets of the universal set  $X = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$  is the universal set, verify that

- i)  $B^C - A^C = A - B$   
ii)  $B - A = B \cap A^C$

- q) Find n, if  ${}^{2n}P_3 = 36({}^nP_2)$ .

r) Find  $\begin{vmatrix} 3 & 4 & 2 \\ -2 & 5 & -5 \\ -1 & 14 & -8 \end{vmatrix}$ .

- s) The rainfall in a city for 7 days was 381 mm. if the rainfall per day doubled that of the previous day, in the above period, find the rainfall on the first day and the last day.

Q3. Attempt the following.

(4 x 5 = 20)

- a) Check whether the statements  $(p \wedge \sim q) \vee q$  and  $(q \wedge \sim p) \vee p$  are equivalent.  
b) If  $A = \{1, 3, 4, 5\}$ ,  $B = \{2, 4, 6, 8\}$ ,  $C = \{1, 4, 6, 7, 9\}$  and the universal set  $X = \{1, 2, 3, \dots, 10\}$ , then verify that i)  $A \cap (B \cap C) = (A \cap B) \cap C$  ii)  $(A \cup B)^C = A^C \cap B^C$

- c) If  $A = \begin{bmatrix} 1 & -1 \\ 4 & 4 \end{bmatrix}$ , find  $A^2 + 3A - 5I$ , where I is the identity matrix of order 2.

- d) Find 4<sup>th</sup> term in the expansion of  $\left[x^2 - \frac{1}{x}\right]^5$ .

OR

QIII. Attempt the following.

(4 x 5 = 20)

- p) State whether the statement  $(p \rightarrow q) \wedge [(\sim p \vee q) \leftrightarrow q]$  is tautology or not.  
q) Let  $X = \{1, 2, 3, \dots, 9, 10\}$  be a universal set. If  $A = \{2, 3, 4, 7, 8\}$ ,  $B = \{1, 2, 5, 7, 8\}$  and  $C = \{4, 6, 8, 9, 10\}$  then verify that  $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ .

r) If  $A = \begin{bmatrix} 2 & 1 \\ -2 & 1 \end{bmatrix}$ ,  $B = \begin{bmatrix} 2 & 1 \\ 0 & 5 \end{bmatrix}$  then verify that  $(AB)^T = B^T \cdot A^T$

s) Find the term independent of x in  $\left[x^2 - \frac{1}{x}\right]^9$ .

**Q4. Attempt the following.**

**(4 x 5 = 20)**

a) How many different numbers can be formed using all the digits of the number  
 (i) 737137                      (ii) 8488448

b) By using binomial theorem prove that  $(\sqrt{2} + 1)^5 - (\sqrt{2} - 1)^5 = 82$

c) Solve the system of equations using Cramer's rule

$$\begin{aligned} 4x + 3y &= 2 \\ 2x - 3y - 8 &= 0 \end{aligned}$$

d) Find the inverse of the matrix  $A = \begin{bmatrix} 1 & 31 \\ 0 & 4 \end{bmatrix}$ .

**OR**

**QIV. Attempt the following.**

**(4 x 5 = 20)**

p) Find the value of  ${}^{10}C_6 + {}^{10}C_5 - {}^9C_6 - {}^9C_5$ .

q) Find the coefficient of  $x^9$  in  $\left(\frac{1}{x^2} + x\right)^{18}$

r) If Find the value of x and y from the matrix equation

$$\begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix} \begin{bmatrix} x & 5 & 3 \\ 2 & y & -5 \end{bmatrix} = \begin{bmatrix} 5 & -3 & -7 \\ 7 & 7 & -1 \end{bmatrix}$$

s) Evaluate  $\begin{vmatrix} x+y & x-y \\ x-y & x+y \end{vmatrix}$ .