S.S.DEMPO COLLEGE OF COMMERCE AND ECONOMICS
ALTINHO, PANAJI – GOA
Semester I Supplementary Examination, June – 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)**

a) If for an A.P. (Arithmetic Progression) $a = 2$, $T_7 = 20$, find T_{21} and d.

b) Construct the truth table for $(p \vee q) \rightarrow \sim r$.

c) The monthly incomes of A and B are in the ratio 4:3 and their monthly expenses are in the ratio 3: 2. If each of them saves ₹ 600 per month, find their monthly incomes.

d) Solve the following equations using Cramer's rule.
$x + 2y - z = 3$, $3x - y + 2z = 1$, $2x - 2y + 3z = 2$

OR

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

w) Find three numbers in A.P. (Arithmetic Progression) such that their sum is 24 and their product is 440.

x) Suppose that the statements p, q, r, s are assigned truth values T, T, F, F respectively, find the truth values of each of the following.

i) $(p \rightarrow r) \leftrightarrow (s \wedge \sim q)$ ii) $(p \vee q) \wedge [(r \rightarrow s) \leftrightarrow \sim q]$

y) The ratio of A's present age to B's present age is 3:10. After 8 years, the corresponding ratio is 5:12. Find their present ages.

z) If $A = \begin{bmatrix} 2 & -1 \\ 4 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -4 \\ 0 & 3 \end{bmatrix}$,

find the matrix X such that X - 2A - 3B = 0.

Q.2. Answer the following. **(5X4=20)**

a) The universal set X= {x/ x is a positive integer less than 15},
A = {3,6,9,12}, B = {1,3,5,9} verify that $(A \cap B)' = A' \cup B'$.

b) Find x and y if

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

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

c) Find the sum of the following series.
9 + 99 + 999 + ---------- to n terms.

d) Find AB where $A = \begin{bmatrix} 1 & -2 & 0 \\ 4 & 3 & -3 \\ 6 & 5 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 1 & 2 \\ -5 & 0 & 4 \\ 6 & 3 & 7 \end{bmatrix}$

OR

Q. II. Answer the following. **(5X4=20)**

w) Let A = Set of letters of the word "MATHEMATICS"
B = Set of letters of the word "ECONOMICS"
C = Set of letters of the word "STATISTICS"
Verify that AU (B ∩ C) = (A U B) ∩ (A U C).

x) Find x if $\begin{vmatrix} x & 2 & -1 \\ 4 & 1 & 2 \\ -3 & -5 & 0 \end{vmatrix} = 0$

y) Find the sum of all natural numbers lying between 200 and 500 exactly divisible by 5.

z) Find x, y, z if $4\begin{bmatrix}1\\-2\\5\end{bmatrix}+3\begin{bmatrix}x\\y\\z\end{bmatrix}=\begin{bmatrix}7\\10\\17\end{bmatrix}$

Q.3. Answer the following. **(5X4=20)**

a) Prove that $(p \wedge q) \wedge \sim(p \vee q)$ is a contradiction.

b) How many different words can be formed with letters of the word "MONDAY" ? How many of these begin with O and end with A?

c) Find n, if ${}^{n}C_4 = 5 \times {}^{n}C_3$

d) Find the adjoint of the following matrix.

$$A = \begin{bmatrix}2 & -1 & 3\\1 & 7 & -5\\0 & -2 & 6\end{bmatrix}$$

OR

Q. III. Answer the following. **(5X4=20)**

w) If p stands for "John is rich" and q stands for "He is hard working" then give the verbal translation of the following statements.
i) $p \wedge q$ ii) $\sim p \wedge \sim q$ iii) $p \rightarrow \sim q$ iv) $\sim(p \vee \sim q)$ v) $p \leftrightarrow q$

x) Find the number of arrangements that can be made from letters of the word "DAUGHTER" so that all vowels occur together.

y) Evaluate $\begin{vmatrix}-5 & 3 & 0\\6 & 4 & -2\\15 & 8 & 10\end{vmatrix}$

z) If $A = \begin{bmatrix} 3 & 1 \\ -1 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 5 \\ -5 & 2 \end{bmatrix}$,
show that $(A + B)(A - B) = A^2 - B^2$

Q.4. Answer the following. **(5X4=20)**

a) There are 5 questions in part A and 4 in part B of a question paper. In how many ways can a student answer 6 questions if he has to choose at least 2 from each part.

b) If for a Geometric Progression $T_3 = 36$ and $T_6 = 972$, find T_8.

c) A furniture shop gave 30% discount on a cupboard which was listed for ₹ 15000. Find the net selling price of the cupboard.

d) In a class of 100 students, the following observations were made, 45 students play cricket, 35 play hockey, 50 play football, 15 students play both cricket and hockey, 10 students play both hockey and football, 12 students play both cricket and football, 4 students play all 3 games. Draw a Venn diagram and find the number of students not playing any game.

OR

Q. IV. Answer the following. **(5X4=20)**

w) What number must be subtracted from each of the numbers 9, 10, 29 and 35, so that the results may be in proportion?

x) Find S_n and S_5 for a G.P. (Geometric Progression) 4, 12, 36, 108, ...

y) A firm allows 25% trade discount on list price and a further discount for cash payment at 10% rate. Find the list price of an article with a net selling price of ₹ 270.

z) Out of 200 students appearing in an examination, 140 passed in English and 100 passed in Economics. If 40 of them failed in both English and Economics, find the number of students passed in both.
