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First Year Bcom - Semester I (Old course)
End semester Examination – October 2015
MATHEMATICAL TECHNIQUES

Duration: 2 hours

Max. Marks: 80

- Instructions: 1) All question are compulsory (choice is internal)
2) Start each new question on a fresh page
3) Figures to the right indicate full marks
4) Use of calculators not allowed*

Q.1 Attempt the following:

(5 x 4=20)

- a) Construct the truth table for $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$
b) If $A = \{x | x^2 - 4x - 5 = 0\}$ and $B = \{x | x^2 - 8x - 9 = 0\}$, find i) $A \cup B$, ii) $A \cap B$
iii) $A - B$, iv) $B - A$
c) Without actual expansion as far as possible prove that $\begin{vmatrix} x-y & x+y & x \\ z-x & z+x & z \\ y-z & y+z & y \end{vmatrix} = 0$
d) The common ratio, last term and sum of a G.P. are 3, 486 and 728 respectively. Find the 1st term and no. of terms

OR

Q.1 Attempt the following:

(5 x 4=20)

- w) Test the validity of the following statements:
"Mr. A is at home or in the office. Whenever he is at home, he plays table tennis. He is not playing table tennis. \therefore He is in the office"
x) In a hostel 15 members take tea, 8 members take coffee and 6 members take milk. If 5 members take tea and coffee both, 4 members take tea and milk both and if none of them take coffee and milk both or all three, find the no. of members in the hostel.
y) Solve the following equations using determinants:
$$\frac{4}{a+2} + \frac{3}{b+1} = -1 \text{ and } \frac{6}{a+2} + \frac{6}{b+1} + 5 = 0$$

z) Find out the 1st term, common difference and nth term for the A.P. in which 7th term is 39 and 10th term is 54.

Q.2 Attempt the following:

(5 x 4=20)

- a) Find the no. of words which can be formed with the letters of each of the word:
i) REPETITION
ii) COMMITTEE
b) If $A = \begin{bmatrix} 2 & 3 \\ -1 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 4 & 1 \\ 0 & -2 \end{bmatrix}$ find the matrix X such that $5A - 3B - 2X = 7I$ where I is an identity matrix.
c) Write down the binomial expansion of $(x^2 - 3y)^5$.
d) Find K if the following equations are consistent:
 $x + y - 3 = 0$, $5x + 6y = 17$, $2x - 3y - k = 0$

OR

Q.II Attempt the following:**(5 x 4=20)**

w) How many ways can 4 books on economics, 3 books on accounts and 1 book each of business statistics, business mathematics and communication skills be arranged on a shelf, so that the books of same subjects are always together?

x) If $A = \begin{bmatrix} 0 & 3 \\ 2 & -1 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 & 2 \\ 1 & -2 & 1 \end{bmatrix}$, $C = \begin{bmatrix} 1 & -2 & 0 \\ 3 & -1 & 2 \end{bmatrix}$
Verify that $A(B + C) = AB + AC$.

y) If the middle term in the expansion $(x^2 + \frac{1}{x})^7$

z) Find x if $\begin{vmatrix} 3 & 5 & 1 \\ 4 & 8 & -1 \\ 9 & 7x-1 & 6 \end{vmatrix} = 0$

Q.3 Attempt the following:**(5 x 4=20)**

a) If $A = \{x|x^2 - 7x + 12 = 0\}$, $B = \{x|x^2 - 5x + 6 = 0\}$, $C = \{x|x^2 - 3x + 2 = 0\}$

Verify that i) $(A - B) \cup (A \cap B) = A$,

ii) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

b) 3 cards are selected from a deck of 52 cards. How many selections will:

i) Contain exactly 3 diamonds.

ii) Not contain any diamonds.

c) Find the adjoint of the matrix $\begin{bmatrix} 1 & -2 & 3 \\ 0 & 2 & 1 \\ -4 & 5 & 2 \end{bmatrix}$.

d) In the following A.P., find the value of n if $3 + 5 + 7 + 9 + \dots$ upto n terms $= 48$

OR**Q.III Attempt the following:****(5 x 4=20)**

w) If A = set of letters of the word "English"

B = set of letters of the word "Commerce"

C = set of letters of the word "Examination"

Verify that $A \cap (B - C) = (A \cap B) - (A \cap C)$

x) A class has 6 girls and 5 boys. If 4 person out of these are to be selected, find the total no. of choices if:

i) There is no restriction on gender.

ii) 3 boys and 1 girl is to be selected.

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

z) Find $8 + 88 + 888 + 8888 + \dots$ $-n$ terms

Q.4 Attempt the following:**(5 x 4=20)**

a) Find the term independent of x in $(x + \frac{1}{x})^8$

b) Find whether following statements are tautology or contradiction:

$$[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (p \rightarrow r)$$

c) Find the 3 nos. in G.P. such that their product is 1000 and the sum of the 2nd and 3rd nos. is 30.

- d) How many different nos. of 4 digits can be formed using the digits 1,3,5,7, and 9 such that
- no digit is repeated
 - repetition of digit is allowed.

OR

Q.IV Attempt the following:

(5 x 4=20)

- w) Find the coefficient of x^{10} in the expansion of $(2x^2 - \frac{1}{x})^{20}$
- x) Prove that the following pair of statements are equivalent:
 $(p \rightarrow q) \vee r, [(p \vee r) \rightarrow (q \vee r)]$
- y) For an A.P. the sum of n terms is $S_n = n(3n - 1)$. Find its n^{th} terms T_n and hence write down its 1st term and common difference.
- z) If ${}^nC_5 = 462$, find nP_5 and n.