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Nuvem, Salcete Goa.

CARMEL COLLEGE OF ARTS, SCIENCE AND COMMERCE FOR WOMEN
SEMESTER END EXAMINATION, OCTOBER 2019

SEMESTER : I of BCOM **SUBJECT : Mathematics**
PAPER NAME : MATHEMATICAL TECHNIQUES (OLD COURSE)
TOTAL MARKS: 80 **Date: 31/10/2019** **DURATION: 2 Hours**

Instructions:

1. *All Questions are Compulsory, however internal choice is available.*
2. *Figures to the right indicate full marks allotted to questions/sub questions.*
3. *Use of calculator is **NOT** allowed.*

Q1. Answer **ANY FOUR** from the following: (4 X 4=1 6)

a) Check if the statements $(p \to q)$ & $\sim(p \wedge \sim q)$ are equivalent.

b) Find 'n' , if ${}^{n}p_4 = 12({}^{n}p_2)$.

c) Find the middle term in the expansion of $(x^2 - \frac{2}{x})^8$.

d) How many different arrangements can be made from the letters of the word "EQUATION" so that
   i. It begins with a consonant and ends with the letter 'O'.
   ii. Vowels occupy the end places.

e) There are 10 chudidars and 8 odanies each of different colours with a student. In how many ways she can go to the college with different combinations.

f) In a group of 40 adults,there are 16 males and 18 vegetarians. Find the number of female non-vegetarians if the group contains 10 male vegetarians.

Q2. Answer **ANY FOUR** from the following: (4 X 4=16)

a) If the Fourth term of a Geometric Progression is 54 & the seventh term is 1458,find the first term & the common ratio.

b) For an Arithmetic Progression, seventh term is 39 and tenth term is 54. find the first term & the common difference.

c) If $A = \begin{bmatrix} 2 & 4 & 4 \\ 4 & 2 & 4 \\ 4 & 4 & 2 \end{bmatrix}$, show that $A^2 - 8A$ is a scalar matrix.

d) Let $A = \begin{bmatrix} 1 & -2 & 0 \\ -5 & 2 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 1 & 2 \\ 4 & 3 & -2 \end{bmatrix}$; find the matrix C if A - B + C is a null matrix.

e) Without expanding the determinant prove that $\begin{vmatrix} ax & by & cz \\ x^2 & y^2 & z^2 \\ 1 & 1 & 1 \end{vmatrix} = \begin{vmatrix} a & b & c \\ x & y & z \\ yz & zx & xy \end{vmatrix}$.

f) Find 'x', if $\begin{vmatrix} 5 & -3 & 7 \\ 2 & 1 & 2 \\ 9 & -1 & x \end{vmatrix} = 0$.

Q3. Answer **a and b OR x and y** from the following:

a. Check the validity of the following argument. (6 marks)
"If Neeta goes to the college then she carries her books. Neeta did not carry her books. Therefore Neeta did not go to the college."

b. A committee of 6 is to be chosen from 15 students of whom 8 are science and 7 are commerce. In how many ways can the selection be made so as to retain a majority of commerce students on the committee. (6 marks)

OR

x. Verify the following statement for tautology or contradiction or neither tautology nor contradiction :
   i. $(p \wedge r) \leftrightarrow (q \to p)$
   ii. $(\sim p \wedge \sim q) \vee (q)$ (6 marks)

y. Seven persons including 3 ladies and 4 gents go for a movie. How many different seating arrangements can be done so that
   (i) anybody can seat anywhere. (6 marks)

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Nuvem, Salcete Goa.

(ii) ladies are never together.

Q4. Answer **a and b** OR **x and y** from the following:

a. Let U = { 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 } be the universal set,
A = { 1, 3, 6, 9, 10 } ; B = {1, 2, 4, 8, 9, 10}; C = {3, 6, 8, 10}
verify if (i) $(A \cup B)' = (A' \cap B')$
(ii) $(A - C) = (C' - A')$
(iii) $(B - C) = (B \cap C')$. (6 marks)

b. Find the coefficient of 'x^{16}' in the expansion of $\left(x^2 - \frac{x}{2}\right)^{10}$ (6 marks)

OR

x. In a class of 75 students,the following observations were made :
40 students play cricket , 35 students play hockey , 30students 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 three games, find
(i) the number of students who play either cricket or football or hockey.
(ii) the number of students not playing any game. (6 marks)

y. Using Binomial theorem, prove that
$(\sqrt{3}+\sqrt{2})^6+(\sqrt{3}-\sqrt{2})^6=970$ (6 marks)

Q5. Answer **a and b** OR **x and y** from the following:

a. Find the three numbers in A.P. whose sum is 24 and sum of their squares is 242. (6 marks)

b. Find the inverse of the matrix $A=\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}$. (6 marks)

OR

x. Find the three numbers in G.P. whose product is 1000 & the sum of the second and the third number is 30. (6 marks)

y. Find the values of 'x' & 'y' from the matrix equation :

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

ii. $\begin{bmatrix} 1 & -8 & -4 \\ 5 & 10 & 4 \end{bmatrix}+\begin{bmatrix} x & 5 & -3 \\ 2 & y & -5 \end{bmatrix}=\begin{bmatrix} 5 & -3 & -7 \\ 7 & 7 & -1 \end{bmatrix}$ (6 marks)

Q6. Answer **a and b** OR **x and y** from the following:

a. Solve the following equations using cramer's rule :
$x + y + z - 5 = 0$; $3x - y - z - 11 = 0$; $4x + 2y + z - 20 = 0$. (6 marks)

b. A person spends Rs. 400 in one day and thereafter increases his daily expenditure by Rs.30, find out when his daily expenditure would be Rs. 850? Also state his total expenditure for the entire period. (6 marks)

OR

x. Show that the following sets of equations are consistent. Also find their common solution.
$x + y = 2$; $2x + 3y = 5$; $5x + 6y = 11$. (6 marks)

y. A sum of Rs. 10,230 is to be paid in 5 monthly installments, such that each installment is four times the previous one, find out his first and the last installments. (6 marks)

********** THE END **********