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MCA 1st Semester Examination

Mathematics (NS)

MCA-104

Time : 3 Hours **Max. Marks : 60**

e candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all by selecting one question from each section A, B, C and D and section E is compulsory. Use of non programmable calculators is allowed. All questions carry equal marks.

SECTION - A

1. (a) If the chance that any one of 5 telephone lines is busy at any instant is 0.01, what is the probability that all the lines are busy? What is the probability that more than 3 lines are busy? (6)

   (b) Show whether the relation $(x, y) \in R$, if $x \geq y$ defined on the set of +ve integers is a partial order relation. (6)

2. (a) If R be an equivalence relation in a set S, then prove that R^{-1} is also an equivalence relation in S. (6)

   (b) Determine the disjunctive normal form of the following Boolean expression: $x \wedge (y \vee z)$. (6)

SECTION - B

3. (a) Use De Moivre's theorem to solve the equation $x^7-1=0$. (6)

[P.T.O.]

(b) How many permutations can be made out of the letter of word 'COMPUTER'? How many of these

(i) Begin with C?

(ii) End with R?

(iii) Begin with C and end with R? (6)

4. (a) The vertices of every planar graph can be properly coloured with five colours. (6)

(b) Solve the recurrence relation $a_{r+2} - 3a_{r+1} + 2a_r = 0$ by the method of generating functions with the initial conditions $a_0 = 2$ and $a_1 = 3$. (6)

SECTION - C

5. (a) Find the eigen values and eigen vector of the matrix

$$\begin{vmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{vmatrix}$$ (6)

(b) Find 'c' of the Lagrange's mean value theorem for $f(x) = x(x - l)(x - 2)$ and $a = 0$, $b = 0.5$. (6)

6. (a) Show that the function $f(x,y) = \begin{cases} \frac{x^3 + 2y^2}{x^2 + y^2}, & (x,y) \neq (0,0) \\ 0, & (x,y) = (0,0) \end{cases}$

is continuous at (0,0) and is not differentiable at (0,0). (6)

(b) Show that the function $f(x, y) = x^3 + y^3 - 63(x + y) + 12xy$ is maximum at (–7, –7) and minimum at (3, 3). (6)

SECTION - D

7. (a) Find a root of the equation $x^3 - x - 11 = 0$, correct to 3 decimal places using bisection method. (6)

(b) Using Simpson's 3/8th rule, evaluate the integrals $\int_0^3 \frac{dx}{1+x^2}$ by taking 6 sub-intervals. Compare it with the exact value. (6)

8. (a) Solve the system of equations

$8x-3y+2z=20$, $6x+3y+12z=35$ and $6x+3y+12z=35$ by Jacobi iteration method. (6)

(b) Use Secant method to obtain a root, correct to three decimal places, of the equation $x^3 - 4x - 9 = 0$. (6)

SECTION - D

9. (a) State De Moivre's Theorem.

(b) Outline the procedure of Gauss elimination method.

(c) Give an example of symmetric and skew symmetric matrix.

(d) Write the limitation of secant method.

(e) Give the difference between permutation and combinations.

(f) Give a procedure to find the maximum and minimum values of a function of two variables. (6×2=12)