[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
(2125)

15605

MCA 1st Semester Examination

Mathematics (NS)

MCA-104

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

The 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 selecting one question from each sections A, B, C and D. Section E is compulsory.

SECTION - A

1. (a) Show that

$$\left[(p \vee q) \vee \left((q \vee (\neg r)) \wedge (p \vee r)\right)\right] \Leftrightarrow \neg\left[(\neg p) \wedge (\neg q)\right]$$ (6)

(b) Determine the validity of the following argument.

If I like mathematics, then I will study.

Either I don't study or I pass mathematics.

If don't graduate, then I didn't pass mathematics.

If I graduate, then I studied. (6)

2. (a) Show that any non empty finite poset must contain maximal and minimal elements. (6)

(b) In a Binomial distribution, the probability of getting success is 1/4 ad standard deviation is 3. Then show its mean is 12. (6)

[P.T.O.]

SECTION - B

3. (a) If the real part of $\frac{z+2}{z-1}$ is 4, then show that the locus of the point representing z in the complex plane is a circle. (6)

(b) prove that two graphs which are isomorphic must contain the same number of triangles. (6)

4. (a) An urn contain 15 red numbered balls and ten white numbered balls. A sample of five balls is selected.

(i) How many samples are possible?

(ii) How many samples contain all red balls?

(iii) How many samples contain three red balls and two white balls? (6)

(b) Let G be a connected plane graph with V vertices, E edges and R regions. Then show that V- E+ R = 2. (6)

SECTION - C

5. (a) Find the eigenvalues and eigenvectors of the matrix

$$A = \begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$$ (6)

(b) Examine the consistency of the following system of linear equations and hence, find the solution.

$4x_1 - x_2 = 12$

$-x_1 + 5x_2 - 2x_3 = 0$

$-2x_2 + 4x_3 = -8$ (6)

6. (a) Examine the maxima and minima and saddle points of the function

$u = x^3 - 3x^2 - 4y^2 + 1$ (6)

(b) If f: $R^2 \to R^2$ defined by $f(x,y) = \begin{cases} \frac{xy}{x^2+y^2}, & (x,y) \neq (0,0) \\ 0, & (x,y) = (0,0) \end{cases}$ is discontinuous at (0,0). (6)

SECTION - D

7. (a) Find the real root of the equation $x^2-5x+2=0$ between 4 and 5 by Newton-Raphson's method using three iterations. (6)

(b) Solve the system of equations by Gauss-Seidel iteration Method

$10x_1+x_2+x_3=12$

$2x_1+10x_2+x_3=13$

$2x_1+2x_2+10x_3=14$ (6)

8. (a) Use bisection method to find out the positive square root of 30 correct to 4 decimal places. (6)

(b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ using Simpson's $\frac{3}{8}$ Rule taking $h = \frac{1}{6}$. Hence compute an approximate value of π. (6)

SECTION - E

9. (a) Construct a truth table for the compound statement $p \wedge ((\neg q) \vee p)$. (2)

(b) Show that the binary relation $\leq$ on the real numbers is a partial order. (2)

[P.T.O.]

(c) Distinguish algebraic equations and transcendental equations. (1)

(d) What is meant by Diagonally Dominant system? (1)

(e) Gauss Seidal method is better than Gauss Jacobi method why? (1)

(f) Define plannar graph, illustrate with example (1)

(g) A man, a woman, a boy, a girl, a dog and a cat are walking down along and winding road one after the other. In how many ways can this happen if the dog comes first? (1)

(h) Simplify $\left(\sin\frac{\pi}{3} + i\cos\frac{\pi}{3}\right)^3$. (1)

(i) An unbiased die is thrown. Then what will be the probability of getting a number other than prime. (1)

(j) Find the eigen values of the matrix $\begin{bmatrix} \sec\theta & \tan\theta \\ -\tan\theta & -\sec\theta \end{bmatrix}$. (1)