

**Course Code: 20MCA101****Course Name: MATHEMATICAL FOUNDATIONS FOR COMPUTING**

Max. Marks: 60

Duration: 3 Hours

**PART A***Answer all questions, each carries 3 marks.*

Marks

- 1 Let  $A = \{1,2,3,4\}$  and  $R = \{(1,2) (1,3) (2,4) (3,2)\}$  be a relation on A. Find the relation matrix. (3)
- 2 Show that the function  $f: R \rightarrow R$  defined by  $f(x) = 3x+7$  is injective. (3)
- 3 Find gcd (306,657) (3)
- 4 Solve the recurrence relation  $3a_{n+1} - 4a_n = 0, n \geq 0, a_1 = 5$ . (3)
- 5 Show that  $K_{3,3}$  is non planar. (3)
- 6 Let G be an undirected graph, prove that the sum of the degrees of vertices in G is equal to twice the number of edges in G. (3)
- 7 Find the rank of the matrix  $\begin{bmatrix} 0 & 1 & 0 \\ -1 & 0 & -4 \\ 0 & 4 & 0 \end{bmatrix}$  (3)
- 8 What is meant by Diagonalization of a matrix? Write the steps for diagonalization of a matrix. (3)
- 9 Write the normal equations for fitting the straight-line  $y = ax + b$ . (3)
- 10 Show that the coefficient of correlation lies between -1 and 1. (3)

**PART B***Answer any one question from each module. Each question carries 6 marks.***Module I**

- 11 a For any sets A, B and C prove that  $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$  (3)
- b Prove that for  $x, y \in Z$  the relation R defined by  $R = \{(x, y): 5 \text{ divides } x - y\}$  is an equivalence relation. (3)

**OR**

- 12 a Let  $f, g: R \rightarrow R$  defined by  $f(x) = x + 1, g(x) = 2x^2 + 3$ . Find fog and gof. Is  $fog = gof$ . (3)
- b Show that the function  $f: R \rightarrow R$  defined by  $f(x) = x^2$  is not invertible. (3)

## Module II

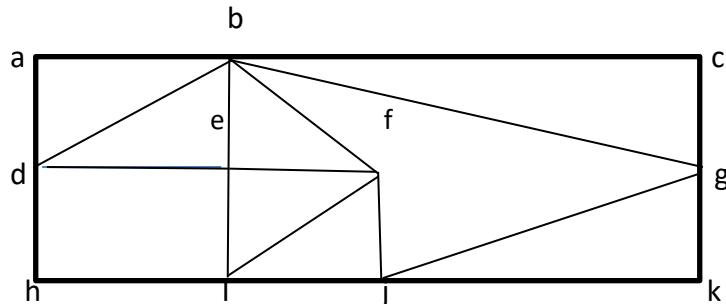
- 13 Solve the linear Diophantine equation  $54x+21y=906$ . (6)

OR

- 14 Solve the recurrence relation  $2a_n = 7a_{n-1} - 3a_{n-2}$ ;  $a_0 = 2, a_1 = 5$ . (6)

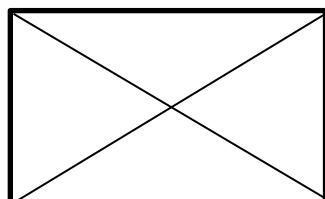
## Module III

- 15 Use Fleury's algorithm to find an Euler circuit for the given graph. (6)



OR

- 16 Define adjacency matrix and incidence matrix. Find the adjacency matrix and incidence matrix of the following graph. (6)



Module IV

- 17 Solve the following linear system of equations using Gauss elimination method: (6)

$$\begin{aligned}x - y + z &= 0 \\-x + y - z &= 0 \\10y + 25z &= 90 \\20x + 10y &= 80\end{aligned}$$

OR

- 18 Find the eigen values and eigen vectors of the matrix (6)

$$\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$$

**Module V**

- 19 Fit a second-degree parabola to the following data . (6)

X	1	2	3	4	5
Y	5	12	26	60	97

**OR**

- 20 Find the correlation coefficient between x and y from the given data (6)

x	9	8	7	6	5	4	3	2	1
y	15	16	14	13	11	12	10	8	9

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