Roll no................

Name.................

code: 20MCA101

FIRST SEMESTER MCA

Model Examination, MARCH 2021

MATHEMATICAL FOUNDATIONS FOR COMPUTING

Time: 2Hours

Max Marks : 60

PART- A

Answer all questions. Each question carries 3 Marks

1. Define equivalence relation. Are the given relationson the set A={1,2,3,4} an equivalence relation $(i)R_1 = \{(1,1),(1,2),(2,1),(2,2),(3,3),(3,4),(4,3),(4,4)\}$

$$(ii)R_2 = \{(1,4),(2,2),(3,3),(4,1),(4,2),(4,4)\}$$

2. Use Euclidean algorithm to obtain x and y satisfying $gcd(272,1479) = 272x + 1479y$.

3. Solve the recurrence relation$6a_n - 7a_{n-1} = 0, n \geq 1$ $a_3 = 343$.

4. Define Hamilton circuit and Euler Circuit with examples.

5. Define (a) Isomorphism of graphs   (b) Adjacency matrix   (c) Incidence matrix

6. Define Equivalence relation with suitable examples.

7. Show that the vector $X_1 = (1,2.1)X_2 = (2,1,4)X_3 = (4,5,6)X_4 = (1,8,-3)$, are linearly dependent.

8. Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$

9. From the pair of regression lines find y

$$3x + 2y = 26$$

$$6x + y = 31$$

10. Calculate the rank correlation for

Ranks in x   1   2   3   4

Rank in y   3   4   2   1

Answer any 1 question from each module . Each question carries Six Marks

MODULE 1

11. Using Warshall's Algorithm, find the transitive closure of the relation

$R = \{(1,4),(2,1),(2,3),(3,1),(3,4),(4,3)\}$ on the set A=\{1,2,3,4\}.   (6 Marks)

OR

12.(a)Let $a, b \in R$ with $b \neq 0$, Define $f: R - \{0\} \to R - \{a\}$ by $f(x) = a + \dfrac{b}{x}$. Prove that

f is bijective.   (4 marks)

    (b)Find the range of the following function by $f(x) = \sqrt{16 - x^2}$ (2 marks)

MODULE 2

13.Solve the set of simultaneous congruences

$x \equiv 2(mod 3), \quad x \equiv 3(mod 5) \qquad x \equiv 2(mod 7)$ (6 Marks)

OR

14.Solve $a_{n+2} - 4 a_{n+1} + 3a_n = -200 , n > 0; \quad given\ that\ a_0 = 3000, a_1 = 3300$

                                                                        (6 Marks)

MODULE 3

15.Let $G = (V, E)$ be an undirected graph or multigraph with no isolated vertices .Show that G has an Euler ciorcuit if and only if g is connected and every vectors in G has even degree.   (6 Marks)

OR

15. (a) show that $A_{3,3}$ is not planar. Define planar graph. State Kuratowski's theorem ..

                                                                        (3 Marks)

    (b) A connected graph G has nine vertices having degree   2,2,2,3,3,3,4,4,5 .Find the number of edges and number of faces of G.   (3 Marks)

MODULE 4

17. Find the two regression lines from the following data

x	1	2	3	4	5	6	7	8	9	10
y	10	12	16	28	25	36	41	49	40	50

(6 Marks)

OR

18. Find the second degree curve of the form $y = ax^2 + bx + c$ to the following data

x	1911	1912	1913	1914	1915
y	10	12	8	10	14

(6 marks)

Module 5

19. Find out what type of conic section the quadratic form

$q = 3x_1^2 + 2\mathbf{1}x_1 x_2 + 3x_2^2 = 0$ represents using orthogonal transformation. (6 Marks)

OR

20. Diagonalize the matrix $\begin{bmatrix} -1 & 2 & -2 \\ 2 & 4 & 1 \\ -2 & 1 & 4 \end{bmatrix}$ (6 Marks)