

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

MCA (Two Year) Degree S1 (R, S) Examination December 2024

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 $B = \{a, b, c, d\}$. If $R = \{(1,a), (1,b), (2,b), (3,a), (3,c), (4,a), (4,d)\}$ is a relation from A to B , write the matrix representation of R . | (3) |
| 2 | Show that $(X \cup Y)' = X' \cap Y'$. | (3) |
| 3 | Find GCD of 306 and 657 and express it as a linear combination of the given numbers. | (3) |
| 4 | Solve the recurrence relation $a_{n+2} - 6a_{n+1} + 9a_n = 0, n \geq 0, a_0 = -1, a_1 = 3$. | (3) |
| 5 | Find the no of edges in a graph having 6 vertices each of degree 3. | (3) |
| 6 | Show that the graph $K_{3,3}$ is non planar. | (3) |
| 7 | Are the vectors $(1,2,1), (2,1,4)$ and $(4,5,6)$ linearly independent? Justify your answer. | (3) |
| 8 | Find out what type of conic section do the quadratic form $Q = 7x^2 + 6xy + 7y^2 = 200$ represents. | (3) |
| 9 | State the principle of least square. | (3) |
| 10 | Two lines of regressions are $x+2y-5=0$ and $2x+3y-8=0$. Find the mean of x and y . | (3) |

PART B

Answer any one question from each module. Each question carries 6 marks.

Module I

- 11 Define an equivalence relation. Let m be an integer with $m > 1$. Show that the (6)

relation $R = \{(a, b) : a \equiv b \pmod{m}\}$ is an equivalence relation on the set of integers.

OR

- 12 Explain closure of relations. Using Warshall's Algorithm find the transitive closure of the relation $R = \{(1,1), (1,2), (2,3), (2,4), (3,4), (4,2)\}$ on the set $A = \{1,2,3,4\}$. (6)

Module II

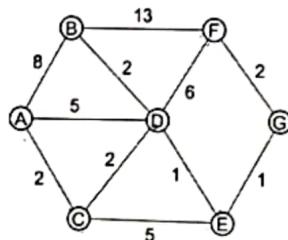
- 13 Solve the Diophantine equation $172x + 20y = 1000$. (6)

OR

- 14 Solve the non-homogeneous recurrence relation, (6)
 $a_{n+2} - 4a_{n+1} + 3a_n = -200, n \geq 0, a_0 = 0, a_1 = 1.$

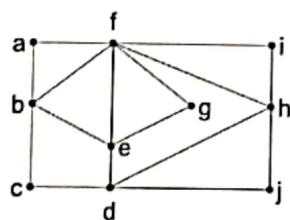
Module III

- 15 Use Dijkstra's Algorithm to calculate the shortest path between the vertices A (6) and F in the weighted graph given below.



OR

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



Module IV

- 17 Solve the system of equations by Gauss elimination method (6)

$$x + y - z = 9$$

$$8y + 6z = -6$$

$$-2x + 4y - 6z = 40$$

OR

- 18 Find the eigen values and eigen vectors of $A = \begin{bmatrix} 4 & -3 & 0 \\ 2 & -1 & 0 \\ 1 & -1 & 1 \end{bmatrix}$ (6)

Module V

- 19 Calculate the correlation coefficient for the following heights (in inches) of father (x) and their son (y). (6)

| | | | | | | | | |
|---|----|----|----|----|----|----|----|----|
| x | 65 | 66 | 67 | 67 | 68 | 69 | 70 | 72 |
| y | 67 | 68 | 65 | 68 | 72 | 72 | 69 | 71 |

OR

- 20 Fit a parabola $y = a + bx + cx^2$ to the following data. (6)

| | | | | | |
|---|---|-----|-----|-----|-----|
| X | 0 | 1 | 2 | 3 | 4 |
| Y | 1 | 1.8 | 1.3 | 2.5 | 6.3 |
