0520RLMCA101122002
APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
First Semester MCA (2 Year) Degree Examination December 2021

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. Verify De-Morgan's laws for the following sets.   (3)

    A={1,2,3}, B={2,3,4} and U={1,2,3,4,5,6}

2. Define the following and give one example for each.   (3)

    i) one- one function   ii) on to function

3. Using division algorithm, find the gcd of 86 and 58.   (3)

4. If $a \equiv b \pmod m$ show that $ac \equiv bc \pmod m$ (3)

5. Define i) complete graph and ii) bipartite graph and give one example for each.   (3)

6. Define Hamiltonian cycle and Euler circuit with examples.   (3)

7. Find the rank of matrix $A = \begin{bmatrix} 0 & 1 & 0 \\ -1 & 0 & -4 \\ 0 & 4 & 0 \end{bmatrix}$ (3)

8. Find the matrix C such that $Q = X^T C X$ (3)

    where $Q = -3x^2 + 4xy - y^2 + 2xz - 5z^2$.

9. State the principle of least square.   (3)

10. Explain the terms correlation and regression.   (3)

PART B

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

Module I

11 a) Let $f, g: R \to R$ defined by $f(x) = x^2 - 2$, $g(x) = x + 4$. Find $f \circ g$ and $g \circ f$. Is $f \circ g = g \circ f$?   (3)

b) Let R be a relation on the set of integers defined by $R = \{(x,y)/x-y \text{ is divisible by } 6\}$.   (3) Check whether R is an equivalence relation.

OR

12 a) Define a partial ordering relation. Show that the inclusion relation $\subseteq$ is a partial   (3) ordering relation on the power set $P(S)$ of a given set S.

b) Using Warshall's algorithm, find the transitive closure of the relation   (3) $\{(1,3),(3,2),(2,4),(3,1),(4,1)\}$ on $\{1,2,3,4\}$.

Module II

13 a) Solve the set of simultaneous congruences, $x \equiv 3 \pmod 5$; $x \equiv 4 \pmod 7$; $x \equiv 6 \pmod 9$.   (6)

OR

14 a) Solve the recurrence relation $a_n - 5a_{n-1} + 6a_{n-2} = 3^n + n$, given $a_0 = 0$ and $a_1 = 1$.   (6)

Module III

15 a) Show that a connected graph G is Euler if and only if all the vertices of G are of even   (6) degree.

OR

16 a) Show that the maximum number of edges in a simple graph with n vertices is nC_2.   (6)

Module IV

17 a) Solve the following system of equations using Guass - Elimination method: (6)

$$x + 2y - z = 3$$
$$3x - y + 2z = 1$$

$$2x - 2y + 3z = 2$$

$$x - y + z = -1$$

OR

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

Module V

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

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

OR

20 a) Fit a straight line to the following set of data (6)

x	5	10	15	20	25
y	16	19	23	26	30

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