USN | | | | | | | | | | **18MATDIP41**

Fourth Semester B.E. Degree Examination, Jan./Feb. 2023
Additional Mathematics – II

Time: 3 hrs.   Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Find the rank of the matrix

$A = \begin{bmatrix} 2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$ by applying elementary row transformations. **(06 Marks)**

b. Solve the following system of equations using Gauss elimination method :
$x - 2y + 3z = 2$, $3x - y + 4z = 4$ and $2x + y - 2z = 5$. **(07 Marks)**

c. Find the eigen values of

$A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ and also the corresponding eigen vectors. **(07 Marks)**

OR

2 a. Find the rank of the matrix by reducing if to echelon form

$A = \begin{bmatrix} 1 & 2 & 2 & 4 \\ 2 & 3 & 4 & 6 \\ 3 & 5 & 6 & 10 \\ 4 & -1 & -3 & 2 \end{bmatrix}$ **(06 Marks)**

b. Test for consistency and solve $5x + 3y + 7z = 4$, $3x + 26y + 2z = 9$, $7x + 2y + 10z = 5$. **(07 Marks)**

c. Solve the following system of equations by Gauss elimination method :
$x + 2y + z = 3$, $2x + 3y + 3z = 10$, $3x - y + 2z = 13$. **(07 Marks)**

Module-2

3 a. Find the interpolating polynomial for the following values.

x	0	1	2	3
f(x)	1	2	1	10

And hence evaluate f(4). **(06 Marks)**

b. The Newton- Raphson method to find a real root of the equation
$x^3 + x^2 + 3x + 4 = 0$ by performing two iterations. **(07 Marks)**

c. Evaluate $\int_0^1 \frac{x \, dx}{1+x^2}$ by Weddle's rule taking seven ordinates. **(07 Marks)**

OR

4 a. Using Newton's interpolation formula find y(1.4) given

X	1	2	3	4	5
Y	10	26	58	112	194

(06 Marks)

b. Find the real root of the equation $\cos x = 3x - 1$ correct upto three decimal using Regula Falsi method. (07 Marks)

c. Evaluate $\int_0^1 \dfrac{dx}{1+x^2}$ by using Simpson's 1/3rd rule taking four equal strips. (07 Marks)

Module-3

5 a. Solve $D^3y + 6D^2y + 11Dy + 6y = 0$. (06 Marks)

b. Solve $\dfrac{d^2y}{dx^2} - 4y = \cosh(2x - 1) + 3^x$ (07 Marks)

c. Solve $y'' + 3y' + 2y = 12x^2$ (07 Marks)

OR

6 a. Solve $D^3y - 2D^2y + 4Dy - 8y = 0$. (06 Marks)

b. Solve $y'' + 4y' - 12y = e^{2x} - 3\sin 2x$ (07 Marks)

c. Solve $\dfrac{d^3y}{dx^3} + \dfrac{d^2y}{dx^2} + 4\dfrac{dy}{dx} + 4y = x^2 - 4x - 6$. (07 Marks)

Module-4

7 a. Form the PDE by eliminating the arbitrary constants $z = a\log(x^2 + y^2) + b$. (06 Marks)

b. Solve $\dfrac{\partial^3 z}{\partial x^2 \partial y} = \cos(2x + 3y)$ (07 Marks)

c. Solve $\dfrac{\partial^2 z}{\partial x^2} + z = 0$, given that when $x = 0$, $z = e^y$ and $\dfrac{\partial z}{\partial x} = 1$. (07 Marks)

OR

8 a. Form the PDE by eliminating the arbitrary function $f\left(\dfrac{xy}{z}, z\right) = 0$. (06 Marks)

b. Solve $\dfrac{\partial^2 u}{\partial x^2} = x + y$. (07 Marks)

c. Solve $\dfrac{\partial^2 z}{\partial y^2} = z$, given the when $y = 0$, $z = e^x$ and $\dfrac{\partial z}{\partial y} = e^{-x}$. (07 Marks)

Module-5

9 a. If A and B are any two events of S which are not mutually exclusive then prove that
$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$
(06 Marks)

b. Define conditional probability. Given for the events A and B, $P(A) = \dfrac{3}{4}$, $P(B) = 1/5$,

$P(A \cap B) = \dfrac{1}{20}$, find $P\left(\dfrac{A}{B}\right)$, $P\left(\dfrac{B}{A}\right)$, $P\left(\dfrac{\overline{A}}{\overline{B}}\right)$, $P\left(\dfrac{\overline{B}}{\overline{A}}\right)$
(07 Marks)

c. Three machines M_1, M_2 and M_3 produce identical items of their respective output 5%, 4% and 3% of items are faulty, on a certain day, M_1 has produced 25% of the total output, M_2 has produced 30% and M_3 the remainder. An item selected at random is found to be faulty. What are the chances that it was produced by M_3?
(07 Marks)

OR

10 a. A bag contains 8 white and 6 red balls. Find the probability of drawing two balls of the same colour.
(06 Marks)

b. State and prove Baye's theorem.
(07 Marks)

c. If a pair of dice is thrown what is the probability that
   i) The sum of numbers is divisible by 4
   ii) The number on the first is greater than that on the second.
(07 Marks)

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