CBCS SCHEME

USN

18MATDIP41

Fourth Semester B.E. Degree Examination, June/July 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 by applying elementary row operations :

$$A = \begin{bmatrix} 0 & 2 & 3 & 4 \\ 2 & 3 & 8 & 4 \\ 4 & 8 & 13 & 12 \end{bmatrix}$$ **(06 Marks)**

b. Test for consistency and solve the system :

$$\begin{aligned} x + y + z &= 6 \\ x - y + 2z &= 5 \\ 3x + y + z &= 8. \end{aligned}$$ **(07 Marks)**

c. Find the eigen value and the corresponding eigen vectors of the matrix :

$$A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}.$$ **(07 Marks)**

OR

2 a. Reduce the matrix A to the echelon firm, where

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

b. Find the values of λ and μ such that the system

$$\begin{aligned} x + y + z &= 6 \\ x + 2y + 3z &= 10 \\ x + 2y + \lambda z &= \mu \end{aligned}$$

may have

i) unique solution

ii) infinite solution

iii) no solution. **(07 Marks)**

c. Solve :

$$\begin{aligned} 2x + y + 4z &= 12 \\ 4x + 11y - z &= 33 \\ 8x - 3y + 2z &= 20 \end{aligned}$$

By Gauss elimination method. **(07 Marks)**

Module-2

3 a. The area of a circle (A) corresponding to diameter (D) is given in the following table :

D	80	85	90	95	100
A	5026	5674	6362	7088	7854

Find the area when D = 105 using an appropriate interpolation formula. **(06 Marks)**

b. Find the real root of the equation cos x = 3x – 1 correct to three decimal places using Regula – Falsi method. **(07 Marks)**

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

OR

4 a. Find $u_{0.5}$ from the data $u_0 = 225$, $u_1 = 238$, $u_2 = 320$, $u_3 = 340$ by using an appropriate interpolation formula. **(06 Marks)**

b. Use Newton – Raphson method to find a real root of the equation $x^3 + 5x - 11 = 0$ correct to the three decimal places. **(07 Marks)**

c. Using Simpson's 1/3rd rule, evaluate $\int_0^1 \frac{dx}{1+x^2}$ by dividing the interval [0, 1] into six equal parts. Hence deduce the value of $\log_e^2$. **(07 Marks)**

Module-3

5 a. Solve $(D^3 - 6D^2 + 11D - 6)\,y = 0$. **(06 Marks)**

b. Solve $(D^2 - 4)y = \cos h\,(2x - 1) + 3^x$. **(07 Marks)**

c. Solve $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = 4\cos^2 x$. **(07 Marks)**

OR

6 a. Solve $\frac{d^3y}{dx^3} + y = 0$. **(06 Marks)**

b. Solve $y'' + 9y = \cos 2x \cdot \cos x$ **(07 Marks)**

c. Solve $y'' - (a + b)y' + aby = e^{ax} + e^{bx}$. **(07 Marks)**

Module-4

7 a. Form a partial differential equation by eliminating the arbitrary constants in $ax^2 + by^2 + z^2 = 1$. **(06 Marks)**

b. Form the partial differential equation by eliminating the arbitrary function from $\ell x + my + nz = \phi(x^2 + y^2 + z^2)$. **(07 Marks)**

c. Solve $\frac{\partial^2 z}{\partial x^2} = a^2 z$, given that when $x = 0$, $z = 0$ and $\frac{\partial z}{\partial x} = a \sin y$. **(07 Marks)**

OR

8 a. Form a partial differential equation by eliminating the arbitrary constructs from :

$z = xy + y\sqrt{x^2 - a^2} + b$. **(06 Marks)**

b. Solve $\frac{\partial^2 z}{\partial x^2} = x + y$ by direct integration. **(07 Marks)**

c. Solve $\frac{\partial^2 z}{\partial y^2} = z$, given that $z = 0$, $\frac{\partial z}{\partial y} = \sin x$, when $y = 0$. **(07 Marks)**

Module-5

9 a. Define :

i) Sample space

ii) Mutually exclusive events

iii) Mutually independent events. **(06 Marks)**

b. A box contains 4 black, 5 white and 6 red balls. If 2 balls are drown at random, what is the probability that :

i) both are red

ii) one black and one white. **(07 Marks)**

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

OR

10 a. If A and B are events with $P(A \cup B) = 7/8$, $P(A \cap B) = 1/4$ and $P(A \cap \bar{B}) = 1/3$.

Find :

i) $P(A)$

ii) $P(B)$

iii) $P(\bar{A} \cap B)$. **(06 Marks)**

b. A problem is given to four students A, B, C, D whose chances of solving it are $1/2, 1/3, 1/4, 1/5$ respectively. Find the probability that the problem is solved. **(07 Marks)**

c. Three machines A, B and C produce 50%, 30% and 20% of the items in a factory. The percentage of defective outputs of these machines are 3, 4, and 5 respectively. If an item is selected at random, what is the probability that it is defective? If a selected item is defective, what is the probability that it is from machine A? **(07 Marks)**

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