CBCS SCHEME

USN

18MATDIP41

Fourth Semester B.E. Degree Examination, Feb./Mar. 2022
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 $A = \begin{bmatrix} 2 & 1 & 3 & 5 \\ 4 & 2 & 1 & 3 \\ 8 & 4 & 7 & 13 \\ 8 & 4 & -3 & -1 \end{bmatrix}$ by reducing into echelon form. **(06 Marks)**

b. Solve the system of equations:
$x+3y-2z=0;\quad 2x-y+4z=0;\quad x-11y+14z=0$ **(07 Marks)**

c. Solve the following system of equations by Gauss elimination method:
$x+y+z=4,\quad 2x+y-z=1,\quad x-y+2z=2$ **(07 Marks)**

OR

2 a. Find the rank of the matrix $A = \begin{bmatrix} 0 & 2 & 3 & 4 \\ 2 & 3 & 5 & 4 \\ 4 & 8 & 13 & 12 \end{bmatrix}$ by reducing into echelon form. **(06 Marks)**

b. Solve the following system of equations:
$x+2y+3z=0;\quad 3x+4y+4z=0;\quad 7x+10y+12z=0$ **(07 Marks)**

c. Find the eigen value and eigen vector of the matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$. **(07 Marks)**

Module-2

3 a. Given f(40) = 184, f(50) = 204, f(60) = 226, f(70) = 250, f(80) = 276, f(90) = 304. Find f(38) using Newton's forward interpolation formula. **(06 Marks)**

b. Find the real root of the equation $x\log_{10}x = 1.2$ near x = 3, correct to 5 decimal places. **(07 Marks)**

c. Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by using Simpson's 1/3rd rule taking 4 equal strips. **(07 Marks)**

OR

4 a. For the following table find y(0.26).

x	0	0.15	0.2	0.25	0.3
y	0.1003	0.1511	0.2027	0.2553	0.3093

(06 Marks)

b. Find the real root of the equation $\cos x = 3x-1$, correct to three decimals by using Regula-Falsi method. **(07 Marks)**

c. Evaluate $\int_4^{5.2} \log_e x\,dx$ taking six equal strips by applying Weddle's rule. **(07 Marks)**

Module-3

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

b. Solve $\frac{d^2y}{dx^2} - 4y = \cosh 2x$. **(07 Marks)**

c. Solve $(D^2 + 3D + 2)y = 4\cos^2 x$. **(07 Marks)**

OR

6 a. Solve $(4D^4 - 8D^3 - 7D^2 + 11D + 6)y = 0$. **(06 Marks)**

b. Solve $(D^3 - 1)y = 3\sin 2x$. **(07 Marks)**

c. Solve $(D^3 + 3D^2)y = 1 + x$ **(07 Marks)**

Module-4

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

b. Solve $\frac{\partial^2 z}{\partial y \partial x} = \frac{x}{y}$ subject to the conditions $\frac{\partial z}{\partial x} = \log_e x$ when y = 1 and z = 0 when x = 1. **(07 Marks)**

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

OR

8 a. Form a partial differential equation by eliminating arbitrary function $\ell x + my + nz = \phi(x^2 + y^2 + z^2)$. **(06 Marks)**

b. Solve $\frac{\partial^2 u}{\partial x \partial t} = e^{-t}\cos x$ given that u = 0 when t = 0 and $\frac{\partial u}{\partial t} = 0$ at x = 0. **(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)**

Module-5

9 a. State and prove addition theorem. **(06 Marks)**

b. If A and B are events with $P(A \cup B) = \frac{7}{8}$, $P(A \cap B) = \frac{1}{4}$ and $P(\overline{A}) = \frac{5}{8}$, find P(A), P(B) and $P(A \cap \overline{B})$. **(07 Marks)**

c. The probability that 3 students A, B, C solve a problem are $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$ respectively. If the problem is simultaneously assigned to all of them, what is the probability that the problem is solved? **(07 Marks)**

OR

10 a. State and prove Baye's theorem. **(06 Marks)**

b. A person A can hit a target three times in five shots, a second person B twice in five shots and a third person C thrice in four shots. They all fire once simultaneously. Find the probability that (i) at least two shots hit and (ii) exactly two shots hit. **(07 Marks)**

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

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