CBCS SCHEME

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18MATDIP41

Fourth Semester B.E. Degree Examination, Dec.2023/Jan.2024
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 $\begin{bmatrix} 1 & 2 & 3 & -2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$. **(06 Marks)**

b. Solve by using Gauss elimination method. Given $x+y+z=9$, $2x+y-z=0$ and $2x+5y+7z=52$. **(07 Marks)**

c. Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$. **(07 Marks)**

OR

2 a. Find the rank of the matrix $\begin{bmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & -2 & 0 \end{bmatrix}$. **(06 Marks)**

b. Find the eigen values and eigen vectors of the matrix $A = \begin{bmatrix} -19 & 7 \\ -42 & 16 \end{bmatrix}$. **(07 Marks)**

c. Find the values of λ and μ so that the equations $x+y+z=6$, $x+2y+3z=10$ and $x+2y+\lambda z=\mu$ have (i) no solution (ii) a unique solution (iii) an infinite number of solutions. **(07 Marks)**

Module-2

3 a. Using Newton Raphson method, find the real root of the equation $3x = \cos x + 1$, correct to four decimal places. Take $x = 0.6$ as the initial approximation. **(06 Marks)**

b. Given f(40) = 184, f(50) = 204, f(60) = 226, f(70) = 250, f(80) = 276, f(90) = 304. Find f(85) using Newton's backward difference interpolation formula. **(07 Marks)**

c. Evaluate $\int_0^6 \frac{1}{1+x^2}dx$ by using Simpson's $\frac{1}{3}$ rule by considering 6 subintervals. **(07 Marks)**

OR

4 a. Using Regula Falsi method, find a real root of the equation $x\log_{10}x - 1.2 = 0$ which lies in (2, 3). Carryout 3 iterations. **(06 Marks)**

b. Using the following data, find y when x = 1. Given,

x	3	4	5	6	7	8	9
y	4.8	8.4	14.5	23.6	36.2	52.8	73.9

Use Newton's forward interpolation formula. **(07 Marks)**

c. Evaluate $\int_4^{5.2} \log x\, dx$ by using Weddle's rules taking 6 subintervals. **(07 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-3

5 a. Solve $(D^3 + 3D^2 + 3D + 1)y = 0$. **(06 Marks)**

b. Solve $(D^2 + 7D + 12)y = \cosh x$. **(07 Marks)**

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

OR

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

b. Solve $(D^2 - 6D + 9)y = 6e^{3x}$. **(07 Marks)**

c. Solve $(D^2 - 5D + 6)y = \sin 3x$. **(07 Marks)**

Module-4

7 a. Form the partial differential equation by eliminating arbitrary functions from $z = y^2 + 2f\left(\frac{1}{x} + \log y\right)$. **(06 Marks)**

b. Form the PDE by eliminating arbitrary constants a and b from the relation $(x - a)^2 + (y - b)^2 + z^2 = k^2$. **(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 function from $\phi(x + y + z,\ x^2 + y^2 + z^2) = 0$. **(06 Marks)**

b. Form a partial differential equation by eliminating arbitrary function from $z = f(x + ct) + g(x - ct)$. **(07 Marks)**

c. Solve $\frac{\partial^2 z}{\partial x \partial y} = \sin x \sin y$ by direct integration. Given that $\frac{\partial z}{\partial y} = -2\sin y$ when x = 0 and z = 0 when y is an odd multiple of $\frac{\pi}{2}$. **(07 Marks)**

Module-5

9 a. Given $P(A) = \frac{1}{4}$, $P(B) = \frac{1}{3}$ and $P(A \cup B) = \frac{1}{2}$. Find P(A/B), P(B/A), $P(A \cap \overline{B})$ and $P(A/\overline{B})$. **(06 Marks)**

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

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

OR

10 a. If A and B are independent events, show that $\overline{A}$ and $\overline{B}$ are also independent. **(06 Marks)**

b. The probability that a team wins a match is $\frac{3}{5}$. If this team plays 3 matches in a tournament, what is the probability that the team wins (i) atleast one match (ii) all matches. **(07 Marks)**

c. An office has 4 secretaries handling respectively 20%, 60% and 15% and 5% of the files of all government reports. The probability that they misfile such reports is respectively 0.05, 0.1 and 0.05. Find the probability that a misfiled report can be blamed on first secretary? **(07 Marks)**

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