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.

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-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)**

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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