CBCS SCHEME

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18MATDIP41

Fourth Semester B.E. Degree Examination, June/July 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. Test for consistency and solve
$5x+3y+7z=5$, $3x+26y+2z=9$, $7x+2y+10z=5$ **(07 Marks)**

b. Find the eigen values and the corresponding eigen vectors for the matrix $A=\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$. **(07 Marks)**

c. Solve the system of equations by Gauss-Elimination method :
$2x+y+4z=12$, $4x+11y-z=33$, $8x-3y+2z=20$ **(06 Marks)**

OR

2 a. Find the rank of the matrix $A=\begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$. **(07 Marks)**

b. Investigate the value of λ and μ such that the system of equations,
$x+y+z=6$, $x+2y+3z=10$, $x+2y+\lambda z=\mu$ may have,
(i) Unique solution
(ii) Infinite solution
(iii) No solution **(07 Marks)**

c. Solve the system of equations by Gauss-elimination method :
$x+y+z=6$, $x-y+2z=5$, $3x+y+z=8$ **(06 Marks)**

Module-2

3 a. Find y(1.4) given that,

x	1	2	3	4	5
y	10	26	58	112	194

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

b. Find a real root of $f(x)=x^3-2x-5=0$, correct to three decimal places, using Regula-Falsi method. **(07 Marks)**

c. Evaluate $\int_0^6 3x^2dx$ dividing the interval [0, 6] into SIX equal parts by applying Simpson's $\left(\frac{1}{3}\right)^{rd}$ rule. **(06 Marks)**

OR

4 a. 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 interpolation formula. **(07 Marks)**

b. Find the real root of the equation $f(x)=xe^x-2=0$ correct to three decimal places, by using Newton-Raphson method. **(07 Marks)**

c. Evaluate $\int_4^{5.2} \log_e x \, dx$, taking 6 equal strips by applying Weddle's rule :

x	4	4.2	4.4	4.6	4.8	5.0	5.2
$y=\log_e x$	1.3863	1.4351	1.4816	1.5261	1.5686	1.6094	1.6487

(06 Marks)

Module-3

5 a. Solve : $(4D^4-4D^3-23D^2+12D+36)y=0$. **(07 Marks)**

b. Solve : $(6D^2+17D+12)y=e^{-x}$ **(07 Marks)**

c. Solve : $y''+9y=\cos 2x \cos x$ **(06 Marks)**

OR

6 a. Solve : $(D^3-2D^2+4D-8)y=0$ **(07 Marks)**

b. Solve : $(D^2-4D+13)y=e^{2x}$ **(07 Marks)**

c. Solve : $(D^2-8D+9)y=8\sin 5x$ **(06 Marks)**

Module-4

7 a. Form the PDE, by eliminating the arbitrary function from $z=f(x^2+y^2)$ **(07 Marks)**

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

c. Solve : $\frac{\partial^2 z}{\partial x^2}-a^2 z=0$ under the conditions $z=0$ and $\frac{\partial z}{\partial x}=a\sin y$ when $x=0$. **(06 Marks)**

OR

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

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

c. Form the PDE, by eliminating the arbitrary constants a and b from the equation : $z=a\log(x^2+y^2)+b$ **(06 Marks)**

Module-5

9 a. In a certain computer centre, 47% of the programmers can program in FORTRAN 35% in PASCAL and 20% in COBOL and every programmer can program in at least one of these languages. If the probability that a randomly chosen programmer can program in FORTRAN and PASCAL is 0.23, COBOL and FORTRAN is 0.12, PASCAL and COBOL is 0.11, determine the probability that a randomly chosen programmer can program in all three languages. **(07 Marks)**

b. Three students x, y, z write an examination. Their chances of passing are $\frac{1}{2}, \frac{1}{3}$ and $\frac{1}{4}$ respectively. Find the probability that, (i) All of them pass (ii) at least one of them passes and (iii) at least two of them pass. **(07 Marks)**

c. A person is known to speak truth 3 out of 4 times. He throws a die and reports that the die shows a six. Find the probability that it is actually a SIX. **(06 Marks)**

OR

10 a. Find the probability that the birth days of 5 persons chosen at random will fall in 12 different calendar months. **(07 Marks)**

b. If A and B are events with $P(A \cup B) = \frac{7}{8}$, $P(A \cap B) = \frac{1}{4}$, $P(A \cap \overline{B}) = \frac{1}{3}$, find $P(A)$, $P(B)$ and $P(\overline{A} \cap B)$. **(07 Marks)**

c. Given $P(A) = \frac{1}{4}$, $P(B) = \frac{1}{3}$ and $P(AUB) = \frac{1}{2}$, evaluate $P\left(A/B\right)$, $P\left(B/A\right)$, $P\left(A \cap \overline{B}\right)$ and $P\left(A/B\right)$. **(06 Marks)**

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