Model Question Paper-2 with effect from 2019-20 (CBCS Scheme)

USN ☐☐☐☐☐☐☐☐☐☐   **18MATDIP41**

Fourth Semester B.E.(CBCS) Examination
Additional Mathematics - II
(Common to all Branches)

Time: **3 Hrs**   Max.Marks: **100**

Note: Answer any FIVE full questions, choosing at least ONE question from each module.

Module-1

1 (a) Find the rank of the following matrix by applying elementary row transformations **(06 Marks)**

$$\begin{bmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \end{bmatrix}.$$

(b) Solve the following system of linear equations by Gauss elimination method: **(07Marks)**
$x+2y+z=3; 2x+3y+3z=10; 3x-y+2z=13.$

(c) Find all the eigenvalues and eigenvector corresponding to the smallest eigenvalue of **(07Marks)**

$$\begin{bmatrix} 2 & 0 & -1 \\ 0 & 2 & 0 \\ -1 & 0 & 2 \end{bmatrix}$$

OR

2 (a) Reduce the matrix into its echelon form, and hence find its rank **(06 Marks)**

$$\begin{bmatrix} 1 & 1 & -1 \\ 2 & -3 & 4 \\ 3 & -2 & 3 \end{bmatrix}$$

(b) Find all the eigenvalues and eigenvector corresponding to the largest eigenvalue of **(07Marks)**

$$\begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$$

(c) Solve the system of linear equations $2x+y+z=7; x+3y+z=10; x+y+z=15$ by applying Gauss elimination method. **(07Marks)**

Module-2

3 (a) Find a real root of $xe^x - \cos x = 0$, correct to three decimal places lying in the interval (0.5,0.6), By using Regula-Falsi method. **(06 Marks)**

(b) Use an appropriate interpolation formula to compute $f(6)$ using the following data **(07Marks)**

x	1	2	3	4	5
$f(x)$	1	-1	1	-1	1

(c) Evaluate $\int_{0}^{\pi/2} \sqrt{\sin x}\, dx$ using Simpson's $(1/3)^{\text{rd}}$ rule, taking 10 equal parts. **(07Marks)**

OR

4 (a) Find a real root of the equation $x\sin x + \cos x = 0,$ near $x = \pi$ correct to four decimal places, using Newton- Raphson method. **(06 Marks)**

(b) Use an appropriate interpolation formula to compute $f(0.15)$ using the following data: **(07Marks)**

x	0.1	0.2	0.3	0.4	0.5	0.6
$f(x)$	2.68	3.04	3.38	3.68	3.96	4.21

(c) Use Weddle's rule to evaluate $\int_{0}^{1} \frac{xdx}{1+x^2}$, by taking seven ordinates. **(07Marks)**

Module-3

5 (a) Solve : $(D^3 - D^2 - 4D - 4)y = 0$. **(06 Marks)**

(b) Solve : $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 5y = 2\cosh x$. **(07Marks)**

(c) Solve : $y'' - 4y = \cos 2x$. **(07Marks)**

OR

6 (a) Solve: $(D^4 + 4D^3 - 5D^2 - 36D - 36)y = 0$. **(06 Marks)**

(b) Solve : $y'' + 5y' + 6y = e^{-2x}$. **(07Marks)**

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

Module-4

7 (a) Form the partial differential equation by eliminating the arbitrary function from **(06 Marks)**

$$z = y^2 + 2f\left(\frac{1}{x} + \log y\right).$$

(b) Form the partial differential equation by eliminating the arbitrary constants from **(07Marks)**

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1.$$

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

OR

8 (a) Form the partial differential equation by eliminating the arbitrary function from **(06 Marks)**

$$f\left(x^2 + y^2, z - xy\right) = 0$$

(b) Form the partial differential equation by eliminating the arbitrary functions from **(07Marks)**
$$z = yf(x) + x\varphi(y)$$

(c) Solve $\frac{\partial^2 z}{\partial x \partial y} = e^{-2y} \cos 3x$, for which $\frac{\partial z}{\partial y} = 0$ when $x = 0$ and $z = 0$ when $y = 0$. **(07Marks)**

Module-5

9 (a) Define conditional probability. For any two events A and B, prove that $P(A \cap B) = P(A)P(B/A)$. **(06 Marks)**

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

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

OR

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

(b) Three major parties *A, B, C* are contesting for power in the elections of a state and the chance of their winning election is in the ratio1:3:5. The parties *A, B, C* respectively have probabilities of banning the online lottery $2/3, 1/3, 3/5.$ What is the probability that there will be a ban on the online lottery in the state? Also, what is the probability that the ban is from the party *C*? **(07Marks)**

(c) A shooter can hit the target in 3 out of 4 shots and another shooter can hit in 2 out of 3 shots. Find the probability that the target is being hit (i) by only one shooter and (ii) when both of them try. **(07Marks)**

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