CBCS SCHEME

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17MATDIP41

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.***

Module-1

1 a. Find the rank of the matrix:

$$A=\begin{bmatrix}2 & 3 & 5 & 4\\ 0 & 2 & 3 & 4\\ 4 & 8 & 13 & 12\end{bmatrix}$$ by elementary row transformations. **(08 Marks)**

b. Solve by Gauss elimination method

$$2x+y+4z=12$$
$$4x+11y-z=33$$
$$8x-3y+2z=20$$ **(06 Marks)**

c. Find all the eigen values for the matrix $A=\begin{bmatrix}8 & -6 & 2\\ -6 & 7 & -4\\ 2 & -4 & 3\end{bmatrix}$ **(06 Marks)**

OR

2 a. Reduce the matrix

$$\begin{bmatrix}1 & 2 & 3 & 2\\ 2 & 3 & 5 & 1\\ 1 & 3 & 4 & 5\end{bmatrix}$$ into its echelon form and hence find its rank. **(06 Marks)**

b. Applying Gauss elimination method, solve the system of equations

$$2x+5y+7z=52$$
$$2x+y-z=0$$
$$x+y+z=9$$ **(06 Marks)**

c. Find all the eigen values for the matrix $A=\begin{bmatrix}7 & -2 & 0\\ -2 & 6 & -2\\ 0 & -2 & 5\end{bmatrix}$ **(08 Marks)**

Module-2

3 a. Solve $\frac{d^3y}{dx^2}-2\frac{d^2y}{dx^2}+4\frac{dy}{dx}-8y=0$. **(08 Marks)**

b. Solve $6\frac{d^2y}{dx^2}+17\frac{dy}{dx}+12y=e^{-x}$. **(06 Marks)**

c. Solve $y''-4y'+13y=\cos 2x$. **(06 Marks)**

OR

4 a. Solve $\frac{d^3y}{dx^3}+6\frac{d^2y}{dx^2}+11\frac{dy}{dx}+6y=0$. **(08 Marks)**

b. Solve $y''+2y+y=\frac{e^{\frac{x}{2}}+e^{-\frac{x}{2}}}{2}$. **(06 Marks)**

c. Solve $y''+2y'+y=2x+x^2$. **(06 Marks)**

Module-3

5 a. Find the Laplace transforms of $\sin 5t \cos 2t$ **(06 Marks)**

b. Find the Laplace transforms of $(3t+4)^3$ **(06 Marks)**

c. Express $f(t) = \begin{cases} \sin 2t & 0 < t < \pi \\ 0 & t > \pi \end{cases}$, in terms of unit step function and hence find L[f(t)]. **(08 Marks)**

OR

6 a. Find the Laplace transforms of $\frac{\sin^2 t}{t}$ **(06 Marks)**

b. Find the Laplace transform of $2^t + t \sin t$ **(06 Marks)**

c. If $f(t) = t^2$, $0 < t < 2$ and $f(t+2) = f(t)$, for $t > 2$, find L[f(t)]. **(08 Marks)**

Module-4

7 a. Find the inverse Laplace Transform of $\frac{3}{s^2} + \frac{2e^{-s}}{s^3} - \frac{3e^{-2s}}{s}$. **(08 Marks)**

b. Find $L^{-1}\left[\frac{s^3+6s^2+12s+8}{s^6}\right]$. **(06 Marks)**

c. Find the inverse Laplace Transform of $\frac{s+5}{s^2-6s+13}$. **(06 Marks)**

OR

8 a. Solve by using Laplace Transform $\frac{d^2y}{dt^2} + k^2 y = 0$, given that $y(0) = 2$, $y'(0) = 0$. **(08 Marks)**

b. Find inverse Laplace Transform of $\frac{1}{(s+1)(s+2)(s+3)}$. **(06 Marks)**

c. Find $L^{-1}\left[\frac{s+1}{s^2+6s+9}\right]$. **(06 Marks)**

Module-5

9 a. Prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$. **(06 Marks)**

b. Find the probability that a leap year selected at random will contain 53 Sundays. **(07 Marks)**

c. An office has 4 secretaries handling 20%, 60%, 15%, 5% respectively of the files of certain reports. The probabilities that they misfile such reports are respectively 0.05, 0.1, 0.1 and 0.05. Find the probability that a misfiled report is caused by the first secretary. **(07 Marks)**

OR

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

b. A problem is given to four students A, B, C, D whose chances of solving it are 1/2, 1/3, 1/4, 1/5 respectively. Find the probability that the problem is solved. **(07 Marks)**

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

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