CBCS SCHEME

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# Fourth Semester B.E. Degree Examination, Dec.2024/Jan.2025
## Additional Mathematics – II

Time: 3 hrs. Max. Marks: 80

*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 the matrix using elementary row operations. Given that,
$$A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}.$$ **(05 Marks)**

b. Apply Gauss elimination method to solve the system of linear equations,
$x + 4y - z = -5$
$x + y - 6z = -16$
$3x - y - z = 4$ **(05 Marks)**

c. Find the Eigen values and Eigen vectors of the matrix $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$. **(06 Marks)**

OR

2 a. Test for consistency and solve the equations,
$5x + 3y + 7z = 4$
$3x + 26y + 2z = 9$
$7x + 2y + 10z = 5$ **(05 Marks)**

b. Find the Rank of the matrix, $A = \begin{bmatrix} 2 & 3 & 4 & -1 \\ 5 & 2 & 0 & -1 \\ -4 & 5 & 12 & -1 \end{bmatrix}$ (using Row operations). **(05 Marks)**

c. Apply Cayley-Hamilton's theorem to find the inverse of the matrix of $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$. **(06 Marks)**

### Module-2

3 a. Solve $(D^3 + D^2 + 4D + 4)y = 0$. **(05 Marks)**

b. Solve $(D-2)^3 y = e^{2x}$. **(05 Marks)**

c. Solve $y'' - 3y' + 2y = 4x^2$ using method of undetermined coefficients. **(06 Marks)**

OR

4 a. Solve $(D^2 - 3D + 2)y = 0$ with $y(0) = 0$ and $y'(0) = 2$. **(05 Marks)**

b. Solve $(D^2 + 4)y = \cos 2x + 3$. **(05 Marks)**

c. Solve $y'' + 4y = \tan 2x$ using method of variation of parameters. **(06 Marks)**





### Module-3

5 a. Find $L\{\cos t \cos 2t \cos 3t\}$. **(05 Marks)**

b. Find $L\{te^{-t} \sin 3t\}$. **(05 Marks)**

c. Find the Laplace transform of the Periodic function, $f(t) = \begin{cases} \sin \omega t, & 0 < t < \frac{\pi}{\omega} \\ 0, & \frac{\pi}{\omega} < t < \frac{2\pi}{\omega} \end{cases}$ with $\frac{2\pi}{\omega}$ is the period. **(06 Marks)**

OR

6 a. Find $L\{e^{2t} \cos^2 t + t^2 + 1\}$. **(05 Marks)**

b. Find $L\left\{\frac{\cos at - \cos bt}{t}\right\}$. **(05 Marks)**

c. Find $L\{f(t)\}$ using unit step function, when $f(t) = \begin{cases} 0, & 0 < t < 1 \\ t-1, & 1 < t < 2 \\ 1, & t > 2 \end{cases}$. **(06 Marks)**

### Module-4

7 a. Find $L^{-1}\left\{\frac{4s+5}{(s-1)^2(s+2)}\right\}$. **(05 Marks)**

b. Find $L^{-1}\left\{\frac{s+2}{s^2 - 4s + 13}\right\}$. **(05 Marks)**

c. Solve $y''' + 2y'' - y' - 2y = 0$ with $y(0) = 0$, $y'(0) = 0$ and $y''(0) = 6$. **(06 Marks)**

OR

8 a. Find $L^{-1}\left\{\frac{s^2 - 3s + 4}{s^3}\right\}$. **(05 Marks)**

b. Find $L^{-1}\left\{\frac{2s^2 - 6s + 5}{s^3 - 6s^2 + 11s - 6}\right\}$. **(05 Marks)**

c. Solve $\frac{dx}{dt} + 5x - 2y = t$, $\frac{dy}{dt} + 2x + y = 0$ with $y(0) = 0$, $x(0) = 0$. **(06 Marks)**



### Module-5

9 a. Define : (i) Sample space (ii) Event (iii) Sample point **(05 Marks)**

b. A bag contains 8 white and 6 red balls. Find the probability of drawing two balls of the same colour. **(05 Marks)**

c. A pair of dice is tossed twice, find the probability of scoring 7 points (i) Once and (ii) at least once. **(06 Marks)**

**OR**

10 a. One problem is given to three students A, B and C, whose chances of solving it are $\frac{1}{2}, \frac{1}{3}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved? **(05 Marks)**

b. If $P(A) = \frac{1}{4}$, $P(B) = \frac{1}{3}$, $P(A \cup B) = \frac{1}{2}$, find $P(A/B)$, $P(B/A)$ and verify that A and B are independent? **(05 Marks)**



c. Three machines $M_1$, $M_2$ and $M_3$. Produce identical items, of which 5%, 4% and 3% are defective. On a certain day $M_1$, $M_2$ and $M_3$ produce 25%, 30% and 45% respectively. An item is drawn at random and is found to be defective. What is the probability that it is drawn from $M_3$? **(06 Marks)**

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