USN | | | | | | | | | | **15MATDIP41**

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

Time: 3 Hrs Max.Marks: 80

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

Module-I

1. (a) Find the rank of the matrix $\begin{bmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \end{bmatrix}$ by elementary applying row transformations. **(06 Marks)**

(b) Solve the following system of linear equations by Gauss elimination method:
$x+2y+z=3; 2x+3y+3z=10; 3x-y+2z=13.$ **(05 Marks)**

(c) Find the inverse of the matrix $\begin{bmatrix} 5 & -2 \\ 3 & 1 \end{bmatrix}$ using Cayley-Hamilton theorem. **(05 Marks)**

OR

2. (a) Find all the eigenvalues and eigenvector corresponding the smallest eigenvalue of $\begin{bmatrix} 1 & -3 & 2 \\ 4 & 4 & -1 \\ 6 & 3 & 5 \end{bmatrix}$ **(06 Marks)**

(b) Reduce the matrix $\begin{bmatrix} 3 & -1 & 2 \\ 1 & 0 & 4 \\ 3 & 1 & 2 \end{bmatrix}$ into its echelon form and hence find its rank. **(05 Marks)**

(c) Solve the system of linear equations $x+y+z=9; 2x-3y+4z=13; 3x+4y+5z=40$ by applying Gauss elimination method. **(05 Marks)**

Module-II

3. (a) Solve: $(D^2+1)y=\cos ecx$ by the method of variation of parameters. **(06 Marks)**

(b)) Solve: $(D^3-1)y=3\cos 2x$ **(05 Marks)**

(c)) Solve: $(D^3+2D^2+D)y=x^3$ **(05 Marks)**

OR

4. (a) Solve: $(D^2-1)y=8xe^x$ by the method of undetermined coefficients. **(06 Marks)**

(b) Solve: $(D^3-7D+6)y=1-x+x^2$, where $D=d/dx$ **(05 Marks)**

(c)) Solve: $(D^2-2D+5)y=e^{2x}\sin x$ **(05 Marks)**

Module-III

5. (a) Find the Laplace transforms of (i) $t^2 \cos 3t$ (ii) $\left(1-e^{-at}\right)/t$ **(06 Marks)**

   (b) Find (i) $L\left\{3\sqrt{t}+4/\sqrt{t}\right\}$ (ii) $L\{\cos t \cos 2t \cos 3t\}$ **(05 Marks)**

   (c) Find the Laplace transform of $f(t)=\begin{cases} E, & 0 \le t \le a/2 \\ -E, & a/2 \le t \le a \end{cases}$ where $f(t+a)=f(t)$. **(05 Marks)**

OR

6. (a) Find the Laplace transforms of (i) $\left[\sqrt{t}+1/\sqrt{t}\right]^3$ (ii) $e^{3t} \sin 5t \sin 3t$ **(06 Marks)**

   (b) Find (i) $L\left\{\left(1+e^{-2t}\right)^2\right\}$ (ii) $L\left\{e^{2t} \cos^2 t\right\}$ **(05 Marks)**

   (c) Express $f(t)=\begin{cases} \sin t & 0 \le t \le \pi \\ \cos t, & t > \pi \end{cases}$ in terms of unit step function and hence find $L\{f(t)\}$. **(05 Marks)**

Module-IV

7. (a) Using Laplace transforms, solve $\dfrac{d^2y}{dt^2}+2\dfrac{dy}{dt}+2y=5\sin t$ subject to the initial conditions $y(0)=0=y'(0)$ **(06 Marks)**

   (a) Find the inverse Laplace transforms of (i) $L^{-1}\left\{(s+2)^3/s^6\right\}$ (ii) $L^{-1}\left\{(s+5)/\left(s^2-6s+13\right)\right\}$ **(05Marks)**

   (c) Find (i) $L^{-1}\left[\log\{(s+a)/(s+b)\}\right]$ (ii) $L^{-1}\left\{3s+2/\left(s^2-s-2\right)\right\}$ **(05 Marks)**

OR

8. (a) By applying Laplace transforms, solve $\dfrac{d^2y}{dx^2}+4\dfrac{dy}{dx}+3y=e^{-t}$ subject to the initial conditions $y(0)=1=y'(0)$. **(06 Marks)**

   (a) Find the inverse Laplace transforms of (i) $L^{-1}\left\{3s+5\sqrt{5}/\left(s^2+8\right)\right\}$ (ii) $L^{-1}\left\{(2s-1)/\left(s^2+4s+29\right)\right\}$ **(05Marks)**

   (c) Find (i) $L^{-1}\left[\cot^{-1}(s/a)\right]$ (ii) $L^{-1}\left[4s+5/\left\{(s+2)(s+1)^2\right\}\right]$ **(05 Marks)**

Module-V

9. (a) State the axiomatic definition of probability. For any two arbitrary events *A* and *B*, prove that P(*A*∪*B*) = P(*A*) + P(*B*) – P(*A*∩*B*). **(06 Marks)**

   (b) The probability that a team wins a match is $3/5$. If this team play 3 matches in a tournament, what is the probability that the team (i) win & (ii) loose, all the matches. **(05 Marks)**

   (c) In an UG class of a reputed engineering college, 70% are boys and 30% are girls; 5% of boys and 3% of the girls are irregular to the classes. What is the probability of a student selected at random is irregular to the classes and what is the probability that the irregular student is a girl? **(05 Marks)**

OR

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

    (b) If A and B are independent events, show that the events $\overline{A}$ *and* $\overline{B}$ are also independent. **(05 Marks)**

    (c) A pair of dice is tossed. Find the probability of scoring "7" points? **(05 Marks)**

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