CBCS SCHEME

USN | | | | | | | | | | |

15MATDIP41

Fourth Semester B.E. Degree Examination, July/August 2022
Additional Mathematics – II

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Find the rank of the matrix by elementary row transformations: $A = \begin{bmatrix} 4 & 0 & 2 & 1 \\ 2 & 1 & 3 & 4 \\ 2 & 3 & 4 & 7 \\ 2 & 3 & 1 & 4 \end{bmatrix}$. **(05 Marks)**

b. Solve the following system of equations by Gauss elimination method
$x + y + z = 9$
$x - 2y + 3z = 8$
$2x + y - z = 3$ **(05 Marks)**

c. Find all the eigen values and the corresponding eigen vectors for the matrix.
$A = \begin{bmatrix} 7 & -2 & 0 \\ -2 & 6 & -2 \\ 0 & -2 & 5 \end{bmatrix}$. **(06 Marks)**

OR

2 a. Reduce the matrix to echelon form and find the rank of the matrix.
$A = \begin{bmatrix} 0 & 2 & 3 & 4 \\ 2 & 3 & 5 & 4 \\ 4 & 8 & 13 & 12 \end{bmatrix}$. **(05 Marks)**

b. Solve the following system of equations by Gauss elimination method:
$x_1 - 2x_2 + 3x_3 = 2$
$3x_1 - x_2 + 4x_3 = 4$
$2x_1 + x_2 - 2x_3 = 5$ **(05 Marks)**

c. Verify Cayley-Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$ Find A^{-1}. **(06 Marks)**

Module-2

3 a. Solve $\frac{d^2y}{dx^2} - 4y = \cosh(2x-1) + 3^x$. **(06 Marks)**

b. Solve $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 4y = 0$ given that $y = 0$, $\frac{dy}{dx} = -1$ at $x = 1$. **(05 Marks)**

c. Solve by the method of undetermined coefficient $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 4e^{3x}$. **(05 Marks)**

OR

4 a. Solve $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6y = e^x$. **(05 Marks)**

b. Solve $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 5y = 0$ subject to, $\frac{dy}{dx} = 2$, $y = 1$ at $x = 0$. **(05 Marks)**

c. Solve by the method of variation of parameters $y'' + a^2y = \sec ax$. **(06 Marks)**

Module-3

5 a. Find: $L\{t \sin at\}$ (05 Marks)

b. Given $f(t) = \begin{cases} E & 0 < t < a/2 \\ -E & a/2 < t < a \end{cases}$ where $f(t + a) = f(a)$. Show that $L\{f(t)\} = \frac{E}{S}\tanh\left(\frac{as}{4}\right)$. (06 Marks)

c. Find $L\{(3t^2 + 4t + 5)u(t-3)\}$. (05 Marks)

OR

6 a. Find $L\left\{\frac{1 - e^{at}}{t}\right\}$. (05 Marks)

b. Prove that $L(\sin at) = \frac{a}{s^2 + a^2}$. (05 Marks)

c. Express the following function in terms of the unit step function and hence find their Laplace transform:

$$f(t) = \begin{cases} \sin t & 0 < t \le \pi/2 \\ \cos t & t > \pi/2 \end{cases}$$ (06 Marks)

Module-4

7 a. Find the inverse Laplace transform of $\frac{1}{(s+1)(s+2)(s+3)}$. (05 Marks)

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

c. Solve the differential equation $y'' - 3y' + 2y = 0$, $y(0) = 0$, $y'(0) = 1$ by Laplace transform techniques. (06 Marks)

OR

8 a. Find $L^{-1}\left\{\frac{s+5}{s^2 - 6s + 13}\right\}$. (05 Marks)

b. Find $L^{-1}\{\cot^{-1}(s/a)\}$. (05 Marks)

c. Solve, $y'' + a^2y = \sin t$ with $y(0) = 0$, $y'(0) = 0$. Using Laplace transform. (06 Marks)

Module-5

9 a. The probability that 3 students A, B, C solve a problem are 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? (05 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 all the matches ii) loose all the matches. (05 Marks)

c. State and prove Baye's theorem. (06 Marks)

OR

10 a. Prove that

$$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(A \cap C) - P(B \cap C) + P(A \cap B \cap C).$$ (06 Marks)

b. A box contains 3 white, 5 black and 6 red balls. If a ball is drawn at random. What is the probability that it is entire red or white? (05 Marks)

c. In a bolt factory there are four machines A, B, C, D manufacturing respectively 20%, 15%, 25%, 40% of the total production. Out of these 5%, 4%, 3%, 2% are defective. If a bolt drawn random was found defective what is the probability that it was manufactured by A. (05 Marks)

* * * * *