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)**

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-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, $y'' + a^2 y = \sin t$ 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)**

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