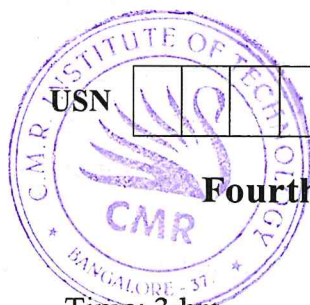


CBCS SCHEME

15MATDIP41



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Fourth Semester B.E. Degree Examination, Jan./Feb. 2021

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

$$A = \begin{bmatrix} 2 & 1 & 3 & 5 \\ 4 & 2 & 1 & 3 \\ 8 & 4 & 7 & 13 \\ 8 & 4 & -3 & -1 \end{bmatrix}$$

by applying elementary row transformations.

(06 Marks)

- b. Solve the system of equations by Gauss-elimination method:

$$x + y + z = 6$$

$$x - y + 2z = 5$$

$$3x + y + z = 8$$

(05 Marks)

- c. Find all eigen values and eigen vectors of the matrix

$$A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$$

(05 Marks)

OR

- 2 a. Find all eigen values and all eigen vectors of the matrix

$$A = \begin{bmatrix} 7 & -2 & 0 \\ -2 & 6 & -2 \\ 0 & -2 & 5 \end{bmatrix}$$

(06 Marks)

- b. Solve by Gauss elimination method:

$$3x + y + 2z = 3$$

$$2x - 3y - z = -3$$

$$x + 2y + z = 4$$

(05 Marks)

- c. Find the inverse of the matrix $\begin{bmatrix} -1 & 3 \\ -2 & 4 \end{bmatrix}$ using Cayley-Hamilton theorem.

(05 Marks)

Module-2

- 3 a. Solve $(D^3 - 6D^2 + 11D - 6)y = 0$

(06 Marks)

- b. Solve $(D^2 + 6D + 9)y = 2e^{-3x}$

(05 Marks)

- c. Solve by the method of variation of parameters $(D^2 + 1)y = \tan x$.

(05 Marks)

OR

- 4 a. Solve $(D^3 - 5D^2 + 8D - 4)y = 0$

(06 Marks)

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

(05 Marks)

- c. Solve by the method of undetermined coefficients $y'' - y' - 2y = 1 - 2x$.

(05 Marks)

Module-3

- 5 a. Find Laplace transform of $\cos^3 at$. (06 Marks)
 b. A periodic function of period $2a$ is defined by

$$f(t) = \begin{cases} E & \text{for } 0 \leq t \leq a \\ -E & \text{for } a \leq t \leq 2a \end{cases} \quad \text{where } E \text{ is a constant. Find } L\{f(t)\}. \quad (05 \text{ Marks})$$

- c. Express the function $f(t) = \begin{cases} \cos t, & t \leq \pi \\ \sin t, & t > \pi \end{cases}$ in terms of unit step function and hence find its Laplace transform. (05 Marks)

OR

- 6 a. Find $L\left\{\frac{\cos at - \cos bt}{t}\right\}$ (06 Marks)
 b. Find $L\{\sin t \sin 2t \sin 3t\}$ (05 Marks)

- c. Express the function $f(t) = \begin{cases} t^2, & t \leq 2 \\ 4t, & t > 2 \end{cases}$ in terms of unit step function and hence find its Laplace transform. (05 Marks)

Module-4

- 7 a. Find $L^{-1}\left\{\frac{2s+3}{s^3-6s^2+11s-6}\right\}$ (06 Marks)
 b. Find $L^{-1}\left\{\cot^{-1}\left(\frac{s}{a}\right)\right\}$ (05 Marks)
 c. Using Laplace transform method, solve the initial value problem $y'' + 5y' + 6y = 5e^{2t}$, given that $y(0) = 2$ and $y'(0) = 1$. (05 Marks)

OR

- 8 a. Find $L^{-1}\left\{\frac{s+2}{s^2-4s+13}\right\}$ (06 Marks)
 b. Find $L^{-1}\left\{\log\left(\frac{s^2+1}{s(s+1)}\right)\right\}$ (05 Marks)
 c. Using Laplace transforms, solve the initial value problem $y' + y = \sin t$, given that $y(0) = 0$. (05 Marks)

Module-5

- 9 a. For any two events A and B, prove that $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ (06 Marks)
 b. If A and B are any two events with $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{3}$ and $P(A \cap B) = \frac{1}{4}$, find $P(A/B)$, $P(B/A)$, $P(\bar{A}/\bar{B})$ and $P(\bar{B}/\bar{A})$ (05 Marks)
 c. From 6 positive and 8 negative numbers, 4 numbers are selected at random and are multiplied. What is the probability that the product is positive? (05 Marks)

OR

- 10 a. State and prove Baye's theorem. (06 Marks)
 b. A book shelf contains 20 books of which 12 are on electronics and 8 are on mathematics. If 3 books are selected at random, find the probability that all the 3 books are on the same subject. (05 Marks)
 c. The 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 is found to be defective, then determine the probability that the item was manufactured by machine A. (05 Marks)