

# CBCS SCHEME

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17MATDIP41

## Fourth Semester B.E. Degree Examination, Feb./Mar. 2022 Additional Mathematics – II

Time: 3 hrs.

Max. Marks: 100

*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 transformation:

$$\begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$$

(06 Marks)

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

$$x + y + z = 9; \quad x - 2y + 3z = 8; \quad 2x + y - z = 3$$

(07 Marks)

- c. Find the eigen values and eigen vectors of the matrix  $\begin{bmatrix} 1 & -2 \\ -5 & 4 \end{bmatrix}$ .

(07 Marks)

OR

- 2 a. Find the rank of the matrix by elementary row transformation

$$\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$$

(06 Marks)

- b. Use Cayley-Hamilton theorem to find the inverse of  $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ .

(07 Marks)

- c. Test for consistency and solve  $x + y + z = 6$ ,  $x - y + 2z = 5$ ,  $3x + y + z = 8$ .

(07 Marks)

### Module-2

- 3 a. Solve  $(D^3 - 2D^2 + 4D - 8)y = 0$  where  $D = \frac{d}{dx}$ .

(06 Marks)

- b. Solve  $(6D^2 + 17D + 12)y = e^{-x}$ , where  $D = \frac{d}{dx}$ .

(07 Marks)

- c. Solve  $(D^2 + a^2)y = \sec ax$  by the method of variation of parameters.

(07 Marks)

OR

- 4 a. Solve  $(D^3 - 3D + 2)y = 0$  where  $D = \frac{d}{dx}$ .

(06 Marks)

- b. Solve  $(D^2 - 4D + 13)y = \cos 2x$  where  $D = \frac{d}{dx}$ .

(07 Marks)

- c. Solve  $(D^2 + 2D + 1)y = 2x + x^2$  where  $D = \frac{d}{dx}$ .

(07 Marks)

**Module-3**

- 5 a. Find the Laplace transform of the function  $L\{e^{-2t}(2\cos 5t - \sin 5t)\}$ . (06 Marks)  
 b. Find the Laplace transform of the function  $L\{t \cdot \cos at\}$ . (07 Marks)  
 c. If  $f(t) = t^2$ ,  $0 < t < 2$ , and  $f(t+2) = f(t)$ , for  $t > 2$ , find  $L\{f(t)\}$  (07 Marks)

**OR**

- 6 a. Find the Laplace transform of the function  $L\{e^{3t} \sin 5t \sin 3t\}$ . (06 Marks)  
 b. Find the Laplace transform of  $\frac{e^{-at} - e^{-bt}}{t}$ . (07 Marks)  
 c. Find the Laplace transform of the function  $L\{3t^2 + 4t + 5\} \cdot u(t-3)$ . (07 Marks)

**Module-4**

- 7 a. Find the inverse Laplace transform of the function  $\left\{ \frac{1}{s+2} + \frac{3}{2s+5} - \frac{4}{3s-2} \right\}$ . (06 Marks)  
 b. Find the inverse Laplace transform of the function  $\frac{3s+2}{(s-2)(s+1)}$ . (07 Marks)  
 c. Solve by using Laplace transforms  $\frac{d^2y}{dt^2} + K^2y = 0$  given that  $y(0) = 2$ ,  $y'(0) = 0$ . (07 Marks)

**OR**

- 8 a. Find the inverse Laplace transform of the function  $\left\{ \frac{s+2}{s^2+36} + \frac{4s-1}{s^2+25} \right\}$ . (06 Marks)  
 b. Find the inverse Laplace transform of the function  $\frac{s+2}{s^2(s+3)}$ . (07 Marks)  
 c. Solve  $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}$ ,  $y(0) = 0$ ,  $y'(0) = 0$  by using Laplace transform method. (07 Marks)

**Module-5**

- 9 a. A bag contains 7 white, 6 red and 5 black balls, two balls are drawn at random. Find the probability that they will both be white. (06 Marks)  
 b. If A and B are any two events, then prove that  $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ . (07 Marks)  
 c. State and prove Bayes's theorem. (07 Marks)

**OR**

- 10 a. A has 2 shares in a lottery in which there are 3 prizes and 5 blanks; B has 3 shares in a lottery in which there are 4 prizes and 6 blanks. Show that A's chance of success is to B's as 27:35. (06 Marks)  
 b. A card is drawn from a well-shuffled pack of playing cards. What is the probability that it is either a spade or an ace? (07 Marks)  
 c. A bag X contains 2 white and 3 red balls and a bag Y contains 4 white and 5 red balls. One ball is drawn at random from one of the bags and is found to be red. Find the probability that it was drawn from bag Y. (07 Marks)

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