## 2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42-8=50, will be treated as malpractice. Important Note: 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.

## Fourth Semester B.E. Degree Examination, Jan./Feb. 2023 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  $\begin{bmatrix} 2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$  (06 Marks)

- b. Test for consistency and solve x + y + z = 6, x y + 2z = 5, 3x + y + z = 8. (07 Marks)
- c. Solve the system of equations by Gauss Elimination Method x + y + z = 9, x 2y + 3z = 8, 2x + y z = 3. (07 Marks)

OR

- 2 a. Find the Eigen values and Eigen vectors of the Matrix  $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$ . (06 Marks)
  - b. Verify Cayley Hamilton theorem for the matrix  $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$  and find its inverse.

(07 Marks)

c. Find the Rank of the Matrix  $\begin{bmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{bmatrix}$ . (07 Marks)

Module-2

3 a. Solve 
$$\frac{d^3y}{dx^3} + 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} + 6y = 0$$
. (06 Marks)

b. Solve 
$$\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = 5e^{-2x}$$
. (07 Marks)

c. Solve 
$$\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 13y = \cos 2x$$
. (07 Marks)

OR

4 a. Solve 
$$\frac{d^2y}{dx^2} + 4y = \sin^2 x$$
. (06 Marks)

b. Solve 
$$(4D^4 - 4D^3 - 23D^2 + 12D + 36)$$
 y = 0. (07 Marks)

c. Solve 
$$\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = x^2$$
. (07 Marks)

Module-3

b. Find the L 
$$\left[\frac{\cos at - \cos bt}{t}\right]$$
. (07 Marks)

c. Find the Laplace Transform of the Periodic function defined by  $f(t) = \frac{Kt}{T}$ , 0 < t < T, f(t+T) = f(t).

OR

6 a. Find Laplace Transform of  $[(3t+4)^3+5^t]$ .

(06 Marks)

b. Find L[t cos a t].

(07 Marks)

c. Express the following function in terms of Unit step function and hence find its Laplace Transform, where

 $f(t) = \begin{cases} t & , & 0 < t < 4 \\ 5 & , & t > 4 \end{cases}.$ 

(07 Marks)

Module-4

7 a. i) Find L<sup>-1</sup>  $\left[\frac{s}{s^2 - 16}\right]$ 

ii) Find  $L^{-1}\left[\frac{(s+2)^3}{s^6}\right]$ .

(06 Marks)

b. Find L<sup>-1</sup>  $\left[ \frac{2s^2 + 5s - 4}{s(s-1)(s+2)} \right]$ .

(07 Marks)

c. Find L<sup>-1</sup>  $\left[ \frac{2s-1}{s^2+4s+29} \right]$ .

(07 Marks)

OR

8 a. Find L<sup>-1</sup>  $\left[ \frac{3}{s^2} + 2 \frac{e^{-s}}{s^3} - 3 \frac{e^{-2s}}{s} \right]$ .

(06 Marks)

b. Find L<sup>-1</sup>  $\left[ \frac{3s+2}{(s-2)(s+1)} \right]$ .

(07 Marks)

c. Solve by using Laplace Transform,  $\frac{d^2y}{dt^2} + k^2y = 0$ , given that y(0) = 2, y'(0) = 0.

(07 Marks)

Module-5

9 a. State and prove Addition Theorem of probability

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

(06 Marks)

- b. The probability that an integrated circuit chip will have defective etching is 0.12. The probability that it will have a crack defect is 0.29 and the probability that it will have both defects is 0.07. What is the probability that a newly manufactured chip will have
  - i) an etching of crack defect?
- ii) neither defect?

(07 Marks)

c. If A and B are events with  $P(A \cup B) = \frac{7}{8}$ ,  $P(A \cap B) = \frac{1}{4}$ ,  $P(A \cap \overline{B}) = \frac{1}{3}$ . Find P(A), P(B) and  $P(\overline{A} \cap B)$ .

(07 Marks)

OR

10 a. State and prove Baye's Theorem.

(06 Marks)

- b. In a certain college 4% of Men students and 1% of Women students are taller than 1.8m. Further more 60% of the students are Women. If a student is selected at random and is found taller than 1.8m, what is the probability that the student is a Women? (07 Marks)
- c. The probability that a communication system will have high fidelity is 0.81 and the probability that it will have high fidelity and high selectivity is 0.18. Find the probability that a system will have high selectivity, given it has high fidelity. (07 Marks)

\* \* \* \* \*