

USN 15MATDIP41

# Fourth Semester B.E. Degree Examination, June/July 2017 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:

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

$$2x + y + 4z = 12$$
  
 $4x + 11y - z = 33$   
 $8x - 3y + 2z = 20$ . (05 Marks)

c. Find all the eigen values and eigen vector corresponding to largest eigen value of the matrix:

$$\begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}.$$
 (05 Marks)

OR

2 a. Solve the following system of equations by Gauss elimination method:

$$x + y + z = 9$$
  
 $2x + y - z = 0$   
 $2x + 5y + 7z = 52$ . (06 Marks)

b. Reduce the matrix  $\begin{vmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{vmatrix}$  into its echelon form and hence find its rank. (05 Marks)

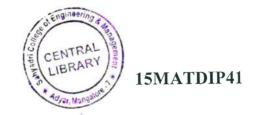
c. Find the inverse of the matrix  $A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$  using Cayley – Hamilton theorem. (05 Marks)

Module-2

a. Solve 
$$(D^2 - 4D + 13)y = \cos 2x$$
 by the method of undetermined coefficients.  
b. Solve  $(D^2 + 2D + 1)y = x^2 + 2x$ .  
c. Solve  $(D^2 - 6D + 25)y = \sin x$ . (05 Marks)

OR

4 a. Solve 
$$(D^2 + 1)y = \tan x$$
 by the method of variation of parameters.  
b. Solve  $(D^3 + 8)y = x^4 + 2x + 1$ . (05 Marks)  
c. Solve  $(D^2 + 2D + 5)y = e^{-x} \cos 2x$ . (05 Marks)



### Module-3

a. Find the Laplace transforms of:

i) 
$$e^{-t}\cos^2 3t$$
 ii)  $\frac{\cos 2t - \cos 3t}{t}$ .

(06 Marks)

b. Find:

i) 
$$L\left[t^{-\frac{5}{2}} + t^{\frac{5}{2}}\right]$$
 ii)  $L\left[\sin 5t \cdot \cos 2t\right]$ .

(05 Marks)

c. Find the Laplace transform of the function :  $f(t) = E \sin(\frac{\pi t}{\omega})$ ,  $0 < t < \omega$ , given that (05 Marks)  $f(t+\omega) = f(t)$ .

# OR

a. Find:

i) 
$$L[t^2 \sin t]$$

i) 
$$L[t^2 \sin t]$$
 ii)  $L[\frac{\sin 2t}{t}]$ .

(06 Marks)

b. Evaluate:  $\int_{0}^{\infty} \frac{\cos 6t - \cos 4t}{t}$  dt using Laplace transform.

(05 Marks)

c. Express  $f(t) = \begin{cases} \sin 2t, & 0 < t < \pi \\ 0, & t > \pi \end{cases}$ , in terms of unit step function and hence find L[f(t)]. (05 Marks)

- 7 a. Solve the initial value problem  $\frac{\frac{\text{Module-4}}{\text{d}x^2}}{\frac{\text{d}x^2}{\text{d}x}} + 6y = 5e^{2x}$ , y(0) = 2, y'(0) = 1 using Laplace (06 Marks) transforms.
  - b. Find the inverse Laplace transforms: i)  $\frac{3(s^2-1)^2}{2s^2}$  ii)  $\frac{s+1}{s^2+6s+9}$ . (05 Marks)
  - Find the inverse Laplace transform :  $\log \left[ \frac{s^2 + 4}{s(s+4)(s-4)} \right]$ . (05 Marks)

### OR

a. Solve the initial value problem:

$$\frac{d^2y}{dt^2} + \frac{4dy}{dt} + 3y = e^{-t} \text{ with } y(0) = 1 = y'(0) \text{ using Laplace transforms.}$$
 (06 Marks)

- b. Find the inverse Laplace transform: i)  $\frac{1}{s\sqrt{5}} + \frac{3}{s^2\sqrt{5}} \frac{8}{\sqrt{5}}$  ii)  $\frac{3s+1}{(s-1)(s^2+1)}$ .
- c. Find the inverse Laplace transform :  $\frac{2s-1}{s^2+4s+29}$ . (05 Marks)



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### Module-5

a. State and prove Baye's theorem.

(06 Marks)

- b. A can hit a target 3 times in 5 shots, B 2 times in 5 shots and C 3 times in 4 shots. They fire a volley. What is the probability that i) two shots hit ii) atleast two shots hit?
- $P(A \cup B) = \frac{7}{8},$ c. Find P(A), P(B) and  $P(A \cap \overline{B})$ , if A and B are events with  $P(A \cap B) = \frac{1}{4} \text{ and } P(\overline{A}) = \frac{5}{8}.$

(05 Marks)

- a. Prove that  $P(A \cup B) = P(A) + (B) P(A \cap B)$ , for any two events A and B. (06 Marks)
  - Show that the events  $\overline{A}$  and  $\overline{B}$  are independent, if A and B are independent events.

(05 Marks)

Three machines A, B and C produce respectively 60%, 30%, 10% of the total number of items of a factory. The percentage of defective output of these machines are respectively 2%, 3% and 4%. An item is selected at random and is found defective. Find the probability (05 Marks) that the item was produced by machine C.