

## I B. Tech II Semester Supplementary Examinations, Jan/Feb-2024

## MATHEMATICS-III

(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 70

*Answer any five Questions one Question from Each Unit  
All Questions Carry Equal Marks*

## UNIT - I

1. a) Find the directional derivative of  $\phi = x^2 - y^2 + 2z^2$  at A in the directional of  $\overline{AB}$  [7M]  
where  $A(1, 2, 3)$  and  $B(5, 0, 4)$
- b) Prove that  $\operatorname{div} \left( \frac{\vec{r}}{r} \right) = \frac{2}{r}$  [7M]

(OR)

2. a) Find work done in moving particle in the force field  $\vec{F} = 3x^2 \vec{i} + (2xz - y)\vec{j} + z\vec{k}$  [7M]  
along the space curve  $x = 2t^3$ ,  $y = t$ ,  $z = 4t^2 - t$  from  $t = 0$  to  $t = 1$ .
- b) Find the flux of vector function  $\vec{F} = (x - 2z)\vec{i} + (x + 3y)\vec{j} + (5x + y)\vec{k}$  through the [7M]  
upper side of the triangle ABC with vertices  $(1, 0, 0)$ ,  $(0, 1, 0)$ ,  $(0, 0, 1)$ .

## UNIT - II

3. a) Find inverse Laplace transform  $\frac{s+4}{s(s-1)(s^2+4)}$  [7M]
- b) Using Convolution theorem find the inverse Laplace transform  $\frac{1}{s^2(1+s)^2}$  [7M]

(OR)

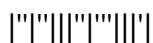
4. a) By change of scale property find  $L\{f(2t)\}$ . If  $L\{f(t)\} = \frac{s+15}{s^2+6s+25}$ . [7M]
- b) Find  $L\left\{t \int_0^t e^{-3t} dt\right\}$  [7M]

## UNIT - III

5. a) Find the Fourier series of  $f(x) = \begin{cases} x + \pi & \text{if } -\pi < x < 0 \\ -x + \pi & \text{if } 0 < x < \pi \end{cases}$  [7M]
- b) Find the Half range cosine series of  $f(x) = e^x$  in  $[0, 1]$  [7M]

(OR)

6. a) Find the Fourier Sine transform of  $f(x) = \begin{cases} x & \text{if } 0 < x < 1 \\ 2 - x & \text{if } 1 < x < 2 \\ 0 & \text{if } x > 2 \end{cases}$  [7M]



- b) Find the inverse Fourier finite cosine transform of  $f(x)$  if [7M]

$$F_c(n) = \frac{\cos\left(\frac{2n\pi}{3}\right)}{(2n+1)^3} \text{ in } (0,1)$$

**UNIT - IV**

7. a) Form the differential equation by elimination arbitrary function from [7M]  
 $f(x+y+z, xy-z^2) = 0$
- b) Solve the Partial Differential Equation  $(x+2z)p + (4z-y)q = 2x+y$ . [7M]

**(OR)**

8. a) Solve the Partial Differential Equation  $z^2 yp + z^2 xq = y^2 x$ . [7M]
- b) Find complete and singular solutions of  $z = px + qy + 2\sqrt{pq}$  [7M]

**UNIT - V**

9. a) Solve the Partial Differential Equation  $(D^3 - 4D^2D^1 + 4DD^1^2)z = 2\sin(3x+2y)$  [7M]
- b) Solve the Partial Differential Equation  $(D^2 + DD^1 - 6D^1^2)z = x+y$  [7M]

**(OR)**

10. a) Solve the Partial Differential Equation  $(D^2 + 2DD^1 + D^1^2)z = e^{2x+3y}$  [7M]
- b) Solve the Partial Differential Equation  $\frac{\partial u}{\partial x} + 4\frac{\partial u}{\partial y} = 0$ ,  $u(0, y) = 3e^{-2y}$  by the [7M]  
method of variation of parameters.

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