Code No: **R201206** **R20** **SET - 1**

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

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UNIT - I

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

   b) Prove that $div\left(\frac{\bar{r}}{r}\right) = \frac{2}{r}$ [7M]

(OR)

2. a) Find work done in moving particle in the force field $\bar{F} = 3x^2\,\bar{i} + (2xz - y)\bar{j} + z\bar{k}$ along the space curve $x = 2t^3$, $y = t$, $z = 4t^2 - t$ from $t = 0$ to $t = 1$. [7M]

   b) Find the flux of vector function $\bar{F} = (x - 2z)\bar{i}\ (x + 3y)\bar{j} + (5x + y)\,\bar{k}$ through the upper side of the triangle ABC with vertices (1, 0, 0), (0, 1, 0), (0, 0, 1). [7M]

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)= $\begin{cases} x+\pi & if\ -\pi < x < 0 \\ -x+\pi & if\ 0 < x < \pi \end{cases}$ [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 $f(x) = \begin{cases} x & if\ 0 < x < 1 \\ 2-x & if\ 1 < x < 2 \\ 0 & if\ x > 2 \end{cases}$ [7M]

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

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

UNIT - IV

7. a) Form the differential equation by elimination arbitrary function from $f(x+y+z,\ xy-z^2)=0$ [7M]

b) Solve the Partial Differential Equation $(x+2z)p+(4z-y)q=2x+y.$ [7M]

(OR)

8. a) Solve the Partial Differential Equation $z^2yp+z^2xq=y^2x$. [7M]

b) Find complete and singular solutions of $z=px+qy+2\sqrt{pq}$ [7M]

UNIT - V

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

b) Solve the Partial Differential Equation $\left(D^2+DD^1-6D^{1^2}\right)z=x+y$ [7M]

(OR)

10. a) Solve the Partial Differential Equation $\left(D^2+2DD^1+D^{1^2}\right)z=e^{2x+3y}$ [7M]

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

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