Sub Code: R2021011 **R20** **Set No. 1**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY- GURAJADA VIZIANAGARAM
II B. Tech I Semester Supplementary Examinations, November – 2024
MATHEMATICS-III
(common to all Branches except EEE)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions
ONE Question from Each unit
All Questions Carry Equal Marks
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1	a)	Prove that $\nabla(r^2) = 2\bar{r}$	[7]
	b)	Find the directional derivative of $\phi = x^2yz + 4xz^2$ in the directional of $2\bar{i} - \bar{j} - 2\bar{k}$ at $(1,-2,-1)$	[8]
		(OR)	
2	a)	Prove that $r^n\bar{r}$ is irrotational.	[7]
	b)	Evaluate $\int_S \bar{F}.\ \bar{n}\ ds$ where $\bar{F} = z\bar{i} + x\bar{j} - 3y^2z\ \bar{k}$ and s is the surface $x^2 + y^2 = 16$ included in the first octant between z = 0 and $z = 5$.	[8]
3	a)	Find Laplace transform of $f(t)$ where $f(t) = \begin{cases} e^t, & 0 < t < 1 \\ 3, & t > 1 \end{cases}$	[7]
	b)	Find Laplace transform of $L\left\{\int_0^t te^{-t}sint\ dt\right\}$	[8]
		(OR)	
4	a)	Find inverse Laplace transform of $\frac{s}{s^4+4a^4}$	[7]
	b)	Find inverse Laplace transform of $\frac{2}{(s^2+1)(s^2+4)}$ using convolution theorem	[8]
5	a)	Find the Fourier series of $f(x) = 2x\ on\ [-1,1]$	[7]
	b)	Find the Half range cosine series of $f(x) = sinx\ on\ [0,\pi]$	[8]
		(OR)	
6	a)	Find the Fourier transform of $f(x)$ defend by $f(x) = \begin{cases} 1\ if\|x\| < 1 \\ 0\ \ if\|x\| > 1 \end{cases}$	[7]
	b)	Find the Finite Fourier sine transform of f(x) = $\frac{x}{\pi}$ in (0, π)	[8]
7	a)	Find partial differential equation by eliminating arbitrary functions from $z = f(2x + 3y) + yg(2x + 3y)$	[7]
	b)	Solve the PDE $\sqrt{p} + \sqrt{q} = x^2$	[8]
		(OR)	
8	a)	Find partial differential equation by eliminating arbitrary functions from $\phi(x^2 + y^2 + z^2, xyz) = 0$	[7]
	b)	Solve the PDE $p - yq = y^2 - x^2$	[8]
9	a)	Solve the PDE $\left(D^2 - 7DD^1 + 12D^{1^2}\right)z = e^{x-y}$	[7]
	b)	Solve the PDE $\left(D^2 + 2DD^1 + D^{1^2}\right)z = x^2 + xy + y^2$	[8]

(OR)

10 a) Solve the PDE $\frac{\partial^2 z}{\partial x^2} = \frac{\partial z}{\partial y} + 2z$by the method of separation of variables [7]

b) Solve the one-dimensional Heat equation is given by $\frac{\partial y}{\partial t} = c^2 \frac{\partial^2 y}{\partial x^2}$ [8]

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