

**PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(AUTONOMOUS)**

II B.Tech I Semester Supplementary Examinations, June - 2024

TRANSFORMS AND VECTOR CALCULUS

(Common to CE, ME, ECE, CSE, CSE(AI&ML), CSE(DS) , CSE(AI)& IT)

Time: 3 hours

Max. Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

Q. No.	Questions	BTL	CO	Marks
UNIT – I				
1.	a) Determine $L\{e^{2t} + 4t^2 - 2\sin 3t + 3\cos 3t + \sinh 2t\}$	K3	CO1	7M
	b) Find $L\{\frac{\sin 3t \cos t}{t}\}$	K3	CO1	7M
OR				
2.	a) Find $L\{\int_0^t e^{-t} \sin 2t \, dt\}$	K3	CO1	7M
	b) show that $\int_0^\infty t e^{-2t} \cos t \, dt = \frac{3}{25}$	K3	CO1	7M
UNIT – II				
3.	a) Find $L^{-1}\{\frac{3(s^2 - 2)^2}{2s^5}\}$	K3	CO2	7M
	b) Find $L^{-1}\left\{\frac{s^2}{(s^2 + a^2)(s^2 + b^2)}\right\}$ by using convolution theorem	K3	CO2	7M
OR				
4.	Solve the differential equation by Laplace transform $\frac{d^3 y}{dt^3} + 2\frac{d^2 y}{dt^2} - \frac{dy}{dt} - 2y = 0$, $y(0) = 1$, $y'(0) = y''(0) = 2$.	K3	CO2	14M
UNIT – III				
5.	Obtain the Fourier series for $f(x) = x \sin x$, $-\pi < x < \pi$. Hence deduce that $\frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - \frac{1}{7.9} + \dots = \frac{1}{4}(\pi - 2)$.	K3	CO3	14M
OR				
6.	Find the Fourier sine and cosine transforms of $f(x) = \frac{e^{-ax}}{x}$ and deduces that $\int_0^\infty \frac{e^{-ax} - e^{-bx}}{x^3} \sin sx \, dx = \tan^{-1}\left(\frac{s}{a}\right) - \tan^{-1}\left(\frac{s}{b}\right)$.	K3	CO3	14M

	UNIT – IV				
7.	a)	Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $z = x^2 + y^2 - 3$ at the point (2, -1, 2).	K3	CO4	7M
	b)	Prove that $\nabla(r^n) = nr^{n-2}\bar{r}$.	K3	CO4	7M
	OR				
8.	a)	Evaluate $\nabla.\left[\nabla\left(\frac{1}{r^3}\right)\right]$	K3	CO4	7M
	b)	Prove that $\text{divcurl } \bar{f} = 0$	K3	CO4	7M
	UNIT – V				
9.	Compute the line integral $\int (y^2 dx - x^2 dy)$ round the triangle whose vertices are (1, 0) (0, 1) (-1, 0) in the xy-plane.		K3	CO5	14M
	OR				
10.	Verify Stokes theorem for $\bar{F} = (2x - y)\bar{i} - yz^2\bar{j} + y^2z\bar{k}$ over the upper half surface of the sphere $x^2 + y^2 + z^2 = 1$ bounded by the projection of the xy-plane.		K3	CO5	14M