Q.P. Code: 20HS0830 **R20**

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech I Year I Semester Regular & Supplementary Examinations March-2023

ALGEBRA AND CALCULUS

(Common to all)

Time: 3 hours Max. Marks: 60

(Answer all Five Units **5 x 12** = **60** Marks)

UNIT-I

1	a	Solve completely the system of equations x+2y+3z=0, 3x+4y+4z=0, 7x+10y+12z=0.	CO1	L3	6M
	b	Show that the equations $x+y+z=4\,;2x+5y-2z=3\,;x+7y-7z=5$ are not consistent.	CO1	L2	6M

OR

2		Find the Eigen values of matrix A and A^{-1} and also find the Eigen vectors of the matrix A, where $A=\begin{bmatrix}-2 & 2 & -3\\ 2 & 1 & -6\\ -1 & -2 & 0\end{bmatrix}$.	CO1	L1	12M

UNIT-II

3	a	State Maclaurin's theorem with Lagrange's form of remainder.	CO2	L1	2M
	b	Using Maclaurin's series expand $\tan x$ up to the fifth power of x and hence find the series for log (sec x).	CO2	L3	10M

OR

4	a	Find a point on the plane $3x+2y+z-12=0$ which is nearest to the origin.	CO2	L3	6M
	b	Find the points on the sphere $x^2+y^2+z^2=4$ that are closest and farthest from the point (3,1,-1).	CO2	L3	6M

UNIT-III

5	a	Evaluate the following improper integrals i) $\int_1^\infty \frac{1}{x^4}dx$. ii) $\int_0^1 \frac{1}{\sqrt{x}}dx$.	CO3	L5	6M
	b	Show that $\int_{-\infty}^{\infty} \frac{1}{1+x^2}dx=\pi$.	CO3	L2	6M

OR

6	a	How to change the variables from Cartesian to polar coordinates in double integrals?	CO4	L2	2M
	b	Evaluate the integral by transforming into polar coordinates $\int_0^a \int_0^{\sqrt{a^2-x^2}} y\sqrt{x^2+y^2}\,dxdy$.	CO4	L5	10M

UNIT-IV

7	a	Find $div\bar{f}$ *if* $\bar{f}=grad(x^3+y^3+z^3-3xyz)$.	CO5	L3	6M
	b	Show that $\bar{f}=(x+3y)\vec{i}+(y-2z)\vec{j}+(x-2z)\vec{k}$ is solenoidal.	CO5	L2	6M

OR

8	a	Find $\nabla \times (\nabla \times \bar{f})$, *if* $\bar{f} = (x^2y)\vec{i} - (2xz)\vec{j} + (2yz)\vec{k}$.	CO5	L3	6M
	b	Prove vector identity that $curl\,(grad\,\emptyset) = 0$.	CO5	L5	6M

UNIT-V

9	a	Define line integral and circulation.	CO6	L1	2M
	b	If $\bar{F} = (x^2 + y^2)\vec{i} - (2xy)\vec{j}$. Evaluate $\int_c \bar{F}.d\bar{r}$ where 'c' is the rectangle in *xy*-plane bounded by $y = 0; y = b$ *and* $x = 0; x = a$.	CO6	L5	10M

OR

10		Verify Gauss's divergence theorem for $\bar{F} = (x^3 - yz)\vec{i} - 2x^2y\vec{j} + z\vec{k}$ taken over the surface of the cube bounded by the planes $x = y = z = a$ and coordinate planes.	CO6	L4	12M

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