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

Reg. No: | | | | | | | | | | |

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech I Year I Semester Regular & Supplementary Examinations May-2022

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	Reduce the matrix A= $\begin{bmatrix} -2 & -1 & -3 & -1 \\ 1 & 2 & 3 & -1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & -1 \end{bmatrix}$ into Echelon form and find its rank?	L1	6M
	b	Solve completely the system of equations x+2y+3z=0,3x+4y+4z=0,7x+10y+12z=0.	L3	6M

OR

2		Find the Eigen values and corresponding Eigen vectors of the matrix $A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$.	L2	12M

UNIT-II

3	a	Verify Lagrange's mean value theorem for f(x) = $x^3 - x^2 - 5x + 3$ in [0,4].	L2	6M
	b	Express the polynomial $2x^3 + 7x^2 + x$-6 in powers of $(x-2)$ using Taylor's series.	L3	6M

OR

4	a	Verify if $u = 2x - y + 3z, v = 2x - y - z, w = 2x - y + z$ are functionally dependent and if so, find the relation between them.	L2	6M
	b	Find a point on the plane $3x+2y+z-12=0$ which is nearest to the origin.	L1	6M

UNIT-III

5	a	Evaluate $\int_0^1 \frac{(\sin^{-1} x)^3}{\sqrt{1-x^2}} dx$	L5	6M
	b	Evaluate $\int_0^5 \int_0^{x^2} x(x^2+y^2)\,dxdy$.	L5	6M

OR

6		Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \frac{dxdydz}{\sqrt{1-x^2-y^2-z^2}}$	L5	12M

UNIT-IV

7	a	If $\bar{r} = x\vec{i} + y\vec{j} + z\vec{k}$ and then show that $\nabla r = \frac{\bar{r}}{r}$	L1	6M
	b	Find the directional derivative of $2xy + z^2$ at $(1,-1,3)$ in the direction of i+2j+3k	L2	6M

OR

8	a	Find the divergence of $\bar{f} = (xyz)\vec{i} + (3x^2y)\vec{j} + (xz^2 - y^2z)\vec{k}$.	L1	6M
	b	Find $curl\ \bar{f}$ if $\bar{f} = grad(x^3 + y^3 + z^3 - 3xyz)$.	L1	6M

UNIT-V

9		Find the work done by a force $\bar{F} = (2y+3)\vec{i} + (xz)\vec{j} + (yz-x)\vec{k}$ when it moves a particle from $(0,0,0)$ to $(2,1,1)$ along the curve $x = 2t^2; y = t; z = t^3$.	L1	12M
		OR		
10	a	State Stoke's theorem.	L1	2M
	b	Use Divergence theorem to evaluate $\iint_S \bar{F}.ds$ *where* $\bar{F} = 4x\bar{i} - 2y^2\bar{j} + z^2\bar{k}$ and 'S' is the surface bounded by the region $x^2 + y^2 = 4, z = 0$ *and* $z = 3$.	L5	10M

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