O.P.Code: 23HS0831	R23	H.T.No.									

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
B.Tech. I Year II Semester Regular & Supplementary Examinations June-2025
DIFFERENTIAL EQUATIONS & VECTOR CALCULUS
(Common to All)

Time: 3 Hours **Max. Marks: 70**

PART-A
(Answer all the Questions **10 x 2 = 20** Marks)

1	a	State Newton's law of cooling.	CO1	L1	2M
	b	Find the Integrating Factor of $\frac{dy}{dx}+y=x$.	CO1	L3	2M
	c	Define Wronskian of functions of y_1 and y_2.	CO2	L1	2M
	d	Solve $\frac{d^2y}{dx^2}-a^2y=0$	CO2	L3	2M
	e	Form the Partial Differential Equation by eliminating the arbitrary functions from $z = f(x) + e^y . g(x)$	CO3	L6	2M
	f	Define Homogeneous Linear Partial differential equation with constant coefficients of n^{th} order.	CO3	L1	2M
	g	Define Solenoidal Vector.	CO4	L1	2M
	h	Find $div\, r$` where $r` = xi` + yj` + zk`$	CO4	L3	2M
	i	Define Line integral.	CO5	L1	2M
	j	State Stoke's theorem.	CO5	L1	2M

PART-B
(Answer all Five Units **5 x 10 = 50** Marks)

UNIT-I

2	a	Solve $x\frac{dy}{dx}+y=\log x$	CO1	L3	5M
	b	Solve $(2x - y + 1)dx + (2y - x - 1)dy = 0$	CO1	L3	5M
		OR			
3		An inductance of 3H and a resistance of 12Ω are connected in series with an e.m.f of 90 V. If the current is zero when t=0, what is the current at the end of 1 sec?	CO1	L1	10M

UNIT-II

4	a	Solve $(D^2 + 5D + 6)y = e^x$	CO2	L3	5M
	b	Solve $(D^2 + D + 1)y = x^3$	CO2	L3	5M
		OR			
5	a	Solve $(D^2 + 4)y = tan\, 2x$ by the method of variation of parameters.	CO2	L3	5M
	b	Find the current 'i' in the L-C-R circuit assuming zero initial current and charge i, if R=80 ohms, L=20 henrys, C=0.01 farads and E=100 V.	CO2	L3	5M

UNIT-III

6	a	Form the Partial Differential Equation by eliminating the constants from $(x - a)^2 + (y - b)^2 = z^2 cot^2 \alpha$. where '$\alpha$' is a parameter.	CO3	L6	5M
	b	Form the Partial Differential Equation by eliminating the constants from $log(az - 1) = x + ay + b$.	CO3	L6	5M

OR

7		Solve $x(y-z)p + y(z-x)q = z(x-y)$	CO4	L3	10M

UNIT-IV

8	a	Find the directional derivative of $xyz^2 + xz$ at (1,1,1) in the direction of normal to the surface $3xy^2 + y = z$ at (0,1,1) .	CO5	L3	6M
	b	Evaluate the angle between the normal to the surface $xy = z^2$ at the points $(4,1,2) and\ (3,3,-3)$.	CO5	L5	4M

OR

9	a	Find $curl\ \bar{f}$ if $\bar{f} = grad(x^3 + y^3 + z^3 - 3xyz)$.	CO5	L3	5M
	b	Prove that $div(curl\bar{f}) = 0$.	CO5	L5	5M

UNIT-V

10		If $\bar{F} = (x^2 + y^2)\bar{i} - (2xy)\bar{j}$. 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

11		Verify Stoke's theorem for the function $F = x^2\bar{i} + xy\bar{j}$ integrated round the square in the plane $z = 0$ whose sides are along the lines $x = 0, y = 0, x = a, y = a$.	CO6	L3	10M

***** END *****