Q.P. Code: 19HS0831 **R19**

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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B. Tech I Year II Semester Regular Examinations October-2020

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(Common to CE, EEE, ME, ECE & AGE)

Time: 3 hours Max. Marks: 60 M

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

UNIT-I

1 **a** Solve the D.E $\left(y^2-2xy\right)dx+\left(2xy-x^2\right)dy=0$ **6M**

b Solve the Bernoulli's D.E $x\dfrac{dy}{dx}+y=x^3y^6$ **6M**

OR

2 **a** Solve $\left(D^2-4D+3\right)y=4e^{3x}$ given $y(0)=-1,\ y'(0)=3$. **6M**

b Solve $\left(D^2+4D+3\right)y=e^{-x}\sin x+x$ **6M**

UNIT-II

3 **a** Solve $\left(D^2-2D\right)y=e^x\sin x$ by method of variation of parameters. **6M**

b Solve $\dfrac{d^2y}{dx^2}+\dfrac{1}{x}\dfrac{dy}{dx}=\dfrac{12\log x}{x^2}$ **6M**

OR

4 An uncharged condenser of capacity is charged applying an e. m. f $E\cdot\sin\left(\dfrac{t}{\sqrt{LC}}\right)$ through leads of self-inductance L and negligible resistance. Prove that at time 't', the charge on one of the plates is $\dfrac{EC}{2}\left[\sin\left(\dfrac{t}{\sqrt{LC}}\right)-\dfrac{t}{\sqrt{LC}}\cos\left(\dfrac{t}{\sqrt{LC}}\right)\right]$. **12M**

UNIT-III

5 **a** Form the Partial Differential Equation by eliminating the constants a,b from $z=a\cdot\log\left[\dfrac{b(y-1)}{(1-x)}\right]$. **6M**

b Form the Partial Differential Equation by eliminating the arbitrary functions f from $xyz=f\left(x^2+y^2+z^2\right)$. **6M**

OR

6 **a** Solve $p(1+q)=qz$ **6M**

b Solve by the method of separation of variables $u_x-4u_y=0,$ where $u(0,y)=8e^{-3y}$ **6M**

UNIT-IV

7	**a**	Find the directional derivative of $2xy+z^2$ at $(1,-1,3)$ in the direction of $\vec{i}+2\vec{j}+3\vec{k}$.	**6M**
	b	Find a, if $\bar{f}=y(ax^2+z)\bar{i}+x(y^2-z^2)\vec{j}+2xy(z-xy)\vec{k}$ is solenoidal.	**6M**

OR

8	**a**	Find $\nabla\times(\nabla\times\bar{f})$, if $\bar{f}=(x^2y)\vec{i}-(2xz)\vec{j}+(2yz)\vec{k}$	**6M**
	b	Prove that $\nabla\cdot(\bar{f}\times\bar{g})=\bar{g}\cdot(\nabla\times\bar{f})-\bar{f}\cdot(\nabla\times\bar{g})$	**6M**

UNIT-V

9	**a**	If $\bar{F}=(5xy-6x^2)\bar{i}+(2y-4x)\bar{j}$ then evaluate $\int_c \bar{F}\cdot d\bar{r}$ along the curve 'c' in $xy-$plane $y=x^3$ from $(1,1)$ to $(2,8)$.	**6M**
	b	If $\bar{F}=2xz\bar{i}-x\vec{j}+y^2\vec{k}$ then evaluate $\int_v \bar{F}\cdot dv$ where 'v' is the region bounded by the surfaces $x=0,\ x=2;\ y=0,\ y=6;$ and $z=x^2,\ z=4$.	**6M**

OR

10	Verify Green's theorem in a plane for $\oint_c (x^2-xy^3)dx+(y^2-2xy)dy$ where 'c' is a square with vertices $(0,0),(2,0),(2,2)$ and $(0,2)$.	**12M**

*** END ***