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

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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech I Year II Semester Supplementary Examinations February-2022

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

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

Time: 3 hours Max. Marks: 60

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

UNIT-I

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

b Solve $(D^2-4D)y=e^x+\sin 3x.\cos 2x$. 6M

OR

2 a Solve $(D^2+1)y=\sin x.\sin 2x$. 6M

b Solve $(1+y^2)dx=(Tan^{-1}y-x)dy$. 6M

UNIT-II

3 a Solve $x^2\dfrac{d^2y}{dx^2}-2x\dfrac{dy}{dx}-4y=x^4$. 5M

b Solve $\dfrac{dx}{dt}+2x+y=0;\ \dfrac{dy}{dt}+x+2y=0$ given that $x=1$ and $y=0$ when $t=0$. 7M

OR

4 a An uncharged condenser of capacity is charged applying an e.m.f. $E\sin\dfrac{t}{\sqrt{LC}}$ through leads of self-inductance L and negligible resistance. Prove that at time $'t'$, the charge on one of the plates is $\dfrac{EC}{2}\left[\sin\dfrac{t}{\sqrt{LC}}-\dfrac{t}{\sqrt{LC}}\cos\dfrac{t}{\sqrt{LC}}\right]$. 7M

b Solve $(D^2+1)y=Co\sec x$ by the method of variation of parameters. 5M

UNIT-III

5 a Solve $\dfrac{\partial^2 z}{\partial x^2}+z=0$ given that $x=0,\ z=e^y,\ \dfrac{\partial z}{\partial x}=1$. 6M

b Solve by the method of separation of variables $4u_x+u_y=3u$ given that $u(0,y)=e^{-5y}$. 6M

OR

6 a Solve $z=px+qy+\sqrt{1+p^2+q^2}$. 6M

b Form the partial differential equation by eliminating the arbitrary functions from $z=xy+f(x^2+y^2)$. 6M

UNIT-IV

7 a Evaluate the angle between the normals to the surface $xy=z^2$ at the points $(4,1,2)$ and $(3,3,-3)$. 6M

b Find $\nabla\times(\nabla\times\bar{f})$, if $\bar{f}=(x^2y)\bar{i}-2xz\bar{j}+2yz\bar{k}$. 6M

OR

8	**a**	Find the directional derivative of $2xyz^2 + xz$ at $(1,1,1)$ in the direction of normal to the surface $3xy^2 + y = z$ at $(0,1,1)$.	**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**	Find the work done by the force $\bar{F} = (2y+3)\vec{i} + xz\,\vec{j} + (yz - x)\vec{k}$ when it moves from $(0,0,0)$ to $(2,1,1)$ along the curve $x = 2t^2, y = t, z = t^3$.	**6M**
	b	Evaluate by Green's theorem evaluate $\oint_c [(y - \sin x)dx + \cos x\,dy]$, where c is the triangle enclosed by the lines $y = 0, x = \frac{\pi}{2}$ and $\pi y = 2x$.	**6M**

OR

10	**a**	If $\bar{F} = (2x^2 + 3z)\vec{i} - 2xy\,\vec{j} - 4x\,\vec{k}$, then evaluate $\int_v \nabla \cdot \bar{F} dv$, where v is the closed region bounded by $x = 0, y = 0, z = 0$ and $2x + 2y + z = 4$.	**5M**
	b	Verify Stoke's theorem for $\bar{F} = (x^2)\vec{i} + (xy)\vec{j}$ around a square with sides along the lines $x = y = 0; x = y = a$.	**7M**

*** END ***