Q.P. Code: 16HS602 **R16**

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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B. Tech I Year I Semester Supplementary Examinations August-2021

ENGINEERING MATHEMATICS-I

(Common to all Branches)

Time: 3 hours Max. Marks: 60

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

UNIT-I

1 **a** Find the orthogonal trajectories of the family of curves $r^n = a^n \cos n\theta$. **6 M**

b Solve $\left(D^2 - 4D + 4\right)y = 8e^{2x}\sin 2x$. **6 M**

OR

2 **a** A body is originally at $80°C$ and cools down to $60°C$ in 20 min. If the temperature of the air is $40°C$, find the temperature of the body after 40 min. **6 M**

b Solve $\left(D^2 + a^2\right)y = \tan ax$ by the method of variation of parameters. **6 M**

UNIT-II

3 **a** If $u = x^2 - y^2$, $v = 2xy$ where $x = r\cos\theta$, $y = r\sin\theta$ then show that $\frac{\partial(u, v)}{\partial(r, \theta)} = 4r^3$. **6 M**

b Find the radius of curvature of the curve $x^2y = a\left(x^2 + y^2\right)$ at $(-2a, 2a)$. **6 M**

OR

4 **a** Show that $\sin^{-1}x = x + \frac{x^3}{3!} + \frac{1^2.3^2}{5!}x^5 + \frac{1^2.3^2.5^2}{7!}x^7 + \ldots\ldots\ldots$ **6 M**

b Find the minimum value of $x^2 + y^2 + z^2$ given $x + y + z = 3a$. **6 M**

UNIT-III

5 **a** Evaluate $\iint r\sin\theta\, dr\, d\theta$ over the cardioids $r = a(1 + \cos\theta)$ above the initial line. **6 M**

b Show that the double integration, the area between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ is $\frac{16}{3}a^2$. **6 M**

OR

6 **a** Evaluate the integral $\int_0^1 \int_x^{\sqrt{x}} \left(x^2 + y^2\right) dx\, dy$. **5 M**

b Evaluate the integral by changing the order of integration $\int_0^1 \int_{x^2}^{2-x} xy\, dy\, dx$. **7 M**

UNIT-IV

7 **a** Find the Laplace transform of $f(t)=2\cosh at\cdot\sin bt$. **6 M**

b Find Laplace Transform of Square-wave function of periodic $2a$, defined as **6 M**

$$f(t)=\begin{cases} k, & 0<t<a \\ -k, & a<t<2a \end{cases}.$$

OR

8 **a** Find the Laplace transform of $f(t)=3\ \cos 3t\cdot\cos 4t$. **6 M**

b Evaluate $\int_0^\infty \frac{\cos at-\sin at}{t}\,dt$ by using Laplace transform method. **6 M**

UNIT-V

9 **a** Find $L^{-1}\left[\frac{3s-2}{s^2-4s+20}\right]$ by using first shifting theorem. **6 M**

b Find $L^{-1}\left[\frac{1}{2}\log\left(\frac{s^2+b^2}{s^2+a^2}\right)\right]$ **6 M**

OR

10 Using Laplace Transform method, solve $y''-3y'+2y=4t+3e^{3t}$ where $y(0)=1$, $y(0)=1$ **12 M**

*** END ***