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**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**  
(AUTONOMOUS)

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

**ENGINEERING MATHEMATICS-II**

(Common to All)

Time: 3 hours

Max. Marks: 60

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

**UNIT-I**

- 1 a Test for consistency and if consistent solve them  $5x+3y+7t=4$ ;  $3x+26y+2t=9$ ;  $7x+2y+10t=5$  **6M**  
 b Discuss for what values of  $\lambda$  and  $\mu$ , the simultaneous equations  $x+y+z=6$ ,  $x+2y+3z=10$ ,  $x+2y+\lambda=\mu$  have (i) no solution (ii) Unique solution **6M**

OR

- 2 Reduce the quadratic form to the sum of squares form by orthogonal reduction. Find index, nature and signature of the quadratic form **12M**  
 $(3x^2 + 5y^2 + 3z^2 - 2yz + 2zx = 2xy)$

**UNIT-II**

- 3 a Verify stoke's for the function  $\vec{F} = x^2\vec{i} + xy\vec{j}$  integrated round the square in the plane  $z=0$  whose sides are along the lines  $x=0$ ,  $y=0$ ,  $x=a$ ,  $y=a$  **8M**  
 b Find  $\text{div } \vec{F}$  where  $\vec{F} = r^n \vec{r}$  **4M**

OR

- 4 Verify Gauss Divergence theorem for  $\vec{F} = (x^3-yz)\vec{i} - 2x^2y\vec{j} + z\vec{k}$  taken over the surface of the cube bounded by the planes  $x=y=z=a$  and coordinate planes. **12M**

**UNIT-III**

- 5 a Find Fourier series of  $f(x)$ , if  $f(x) = \begin{cases} x, & 0 \leq x \leq \pi \\ 2\pi - x, & \pi \leq x \leq 2\pi \end{cases}$  **8M**

$$\text{Hence deduce that } 1 + \frac{1}{3^2} + \frac{1}{5^2} + \dots = \frac{\pi^2}{8}$$

- b Express  $f(x) = x^2 - 2$  as a Fourier series in  $-2 \leq x \leq 2$ . **4M**

OR

- 6 a obtain Fourier series for  $f(x) =$  **6M**

$$f(x) = \begin{cases} \pi x, & 0 \leq x \leq 1 \\ \pi(2-x), & 1 \leq x \leq 2 \end{cases}$$

- b Find the half-range cosine series for  $f(x) = (x-1)^2$  is  $0 < x < 1$ . Hence show that **6M**

$$\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots = \frac{\pi^2}{6}$$

**UNIT-IV**

- 7 a Prove that  $F[x^n f(x)] = (-i)^n \frac{d^n}{dp^n} [F(p)]$  **6M**

- b Prove that  $F_x \{ x f(x) \} = - \frac{d}{dp} [ F_c(p) ]$  **6M**

OR

- 8 Find the Fourier sine and cosine transforms of  $f(x) = e^{-ax}$ ,  $a > 0$  and hence deduce the integrals (i)  $\int_0^\infty \frac{p \sin px}{a^2 + p^2} dp$  (ii)  $\int_0^\infty \frac{\cos px}{a^2 + p^2} dp$  **12M**

## UNIT-V

- 9 a Form the P. D. E by eliminating arbitrary function from  $z = xy + f(x^2 + y^2)$  6M  
 b Solve by the method of separation of variables  $4u_x + u_y = 3u$  and  $u(0,y) = e^{-5y}$ . 6M

OR

- 10 A String of length  $l$  is initially at rest in equilibrium position and each of its points is given the velocity  $(\frac{\partial y}{\partial t})_{t=0} = b \sin^3(\frac{\pi x}{l})$ . Find the displacement  $y(x,t)$ . 12M

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