Q.P. Code: 16HS611 **R16**

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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B Tech I Year II Semester Supplementary Examinations Dec 2019

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 Discuss for what values of a, b the equations $x+y+z=3,\ x+2y+2z=6,\ x+ay+3z=b$ have (i) no solution (ii) a unique solution (iii) an infinite number of solutions. **6 M**

b Find the rank of the matrix $A=\begin{bmatrix} 2 & 1 & 3 & 5 \\ 4 & 2 & 1 & 3 \\ 8 & 4 & 7 & 13 \\ 8 & 4 & -3 & -1 \end{bmatrix}$ by using Echelon form. **6 M**

OR

2 Reduce the quadratic form $3x^2+5y^2+3z^2-2yz+2zx-2xy$ to canonical form by orthogonal reduction technique. **12 M**

UNIT-II

3 a Find the directional derivative of $\phi(x, y, z)=x^2yz+4xz^2$ at the point $(1,-2,-1)$ in the direction of the normal to the surface $f(x, y, z)=x\log z-y^2$ at $(-1, 2, 1)$. **6 M**

b Find div $\bar{f}$ where $\bar{f}=\text{grad}\left(x^3+y^3+z^3-3xyz\right)$. **6 M**

OR

4 Verify Green's theorem for $\int_c (xy+y^2)\,dx+x^2\,dy$ where c is the region bounded by $y=x$ and $y=x^2$. **12 M**

UNIT-III

5 a Estimate the values of Fourier coefficients $a_0,\ a_n,\ b_n$ for the function $f(x)=e^{-ax}$ in $(-\pi,\pi)$ and hence develop Fourier series for this function. **6 M**

b Obtain the Fourier series for the function $f(x)=|x|$ in $-\pi<x<\pi$. **6 M**

OR

6 a Obtain the Fourier cosine series expansion of $f(x)=x\sin x$ in $(0,\ \pi)$. **6 M**

b Develop half range sine series for the function $f(x)=x$ range $0<x<2$. **6 M**

UNIT-IV

7 a State Fourier integral theorem and applying Fourier integral show that $e^{-ax} - e^{-bx} = \frac{2(b^2-a^2)}{\pi} \int_0^\infty \frac{\lambda \sin \lambda x}{\left(\lambda^2+a^2\right)\left(\lambda^2+b^2\right)} d\lambda$ where $a, b > 0$. **6 M**

b Express $f(x) = \begin{cases} 1, & \text{for } 0 \le x \le \pi \\ 0, & \text{for } x > \pi \end{cases}$ as a Fourier sine Integral and Hence evaluate $\int_0^\infty \frac{1-\text{Cos}(\pi\lambda)}{\lambda} \text{Sin}(x\lambda)\, d\lambda$. **6 M**

OR

8 Find the Fourier sine and cosine transforms of $f(x) = \frac{e^{-ax}}{x}$ and deduce that $\int_0^\infty \frac{e^{-ax} - e^{-bx}}{x} \sin sx\, dx = \tan^{-1}(s/a) - \tan^{-1}(s/b)$. **12 M**

UNIT-V

9 a Construct a partial differential equation by eliminating the arbitrary functions f, g from $z = y f(x) + x g(y)$. **6 M**

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

OR

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

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