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

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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B Tech I Year II Semester (R16) Supplementary Examinations October-2020

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 λ, μ the equations $x+y+z=6$, $x+2y+3z=10$, $x+2y+\lambda z=\mu$ have (i) no solution (ii) a unique solution (iii) an infinite number of solutions. **6 M**

b Reduce the matrix $A=\begin{bmatrix} 1 & 2 & 1 & 2 \\ 1 & 3 & 2 & 2 \\ 2 & 4 & 3 & 4 \\ 3 & 7 & 5 & 6 \end{bmatrix}$ into normal form, and also find its rank. **6 M**

OR

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

UNIT-II

3 **a** Find the directional derivative of $\phi(x, y, z)=x^2-y^2+2z^2$ at the point $P=(1, 2, 3)$ in the direction of the line $\overline{PQ}$ where $Q=(5, 0, 4)$. **6 M**

b Find $\operatorname{div} \bar{f}$ where $\bar{f}=r^n \bar{r}$. Find n if it is solenoidal. **6 M**

OR

4 Verify Green's theorem for $\int_c (3x^2-8y^2)\,dx+(4y-6xy)\,dy$ where c is the region bounded by $x=0$, $y=0$ and $x+y=1$. **12 M**

UNIT-III

5 **a** Prove that $x^2=\dfrac{\pi^2}{3}+4\sum_{n=1}^{\infty}(-1)^n\dfrac{\cos nx}{n^2}$, $-\pi<x<\pi$ and hence show that $\sum\dfrac{1}{n^2}=\dfrac{\pi^2}{6}$. **6 M**

b Write Fourier series for the function $f(x)=2x-x^2$ in $(0, 3)$ and hence deduce that $\dfrac{\pi}{12}=\dfrac{1}{1^2}-\dfrac{1}{2^2}+\dfrac{1}{3^2}-\dfrac{1}{4^2}+\cdots$ **6 M**

OR

6 **a** If $f(x)=\begin{cases} 0, & -\pi \le x \le 0 \\ \sin x, & 0 \le x \le \pi \end{cases}$ then show that $f(x)=\dfrac{1}{\pi}+\dfrac{\sin x}{2}-\dfrac{2}{\pi}\sum_{n=1}^{\infty}\dfrac{\cos 2nx}{4n^2-1}$. **6 M**

b Obtain Fourier series for the function $f(x)=\begin{cases} \pi x, & 0 \le x \le 1 \\ \pi(2-x), & 1 \le x \le 2 \end{cases}$ and hence deduce that $\dfrac{\pi^2}{8}=\dfrac{1}{1^2}+\dfrac{1}{3^2}+\dfrac{1}{5^2}+-----$. **6 M**

UNIT-IV

7 **a** Show that $\displaystyle\int_0^{\infty}\frac{1-\cos \pi\lambda}{\lambda}\sin x\lambda \; d\lambda=\begin{cases} \pi/2, & \text{if } 0<x<\pi \\ 0, & \text{if } x>\pi \end{cases}$ making use of Fourier integral. **6 M**

b Applying Fourier sine integral formula, show that **6 M**

$e^{-ax}-e^{-bx}=\dfrac{2(b^2-a^2)}{\pi}\displaystyle\int_0^{\infty}\frac{\lambda \sin \lambda x}{(\lambda^2+a^2)(\lambda^2+b^2)}\, d\lambda$ where $a,b>0$.

OR

8 Find the Fourier cosine transform of $f(x)=\dfrac{1}{1+x^2}$ and applying it find Fourier sine transform of $\phi(x)=\dfrac{x}{1+x^2}$. **12 M**

UNIT-V

9 **a** Form the partial differential equation by eliminating the arbitrary function from $z=y^2+2f\left(\dfrac{1}{x}+\log y\right)$ **6 M**

b Solve by method of separation of variables $3u_x+2u_y=0$ and $u(x,0)=4e^{-x}$ **6 M**

OR

10 A homogenous rod of conducting material of length 100cm has its ends kept at zero Temperature and the temperature initially $u(x,0)=\begin{cases} x; & 0 \le x \le 50 \\ 100-x; & 50 \le x \le 100 \end{cases}$. Find the temperature $u(x,t)$ at any time. **12 M**

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