Q.P. Code: 18HS0830 **R18**

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

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech. I Year I Semester Supplementary Examinations June 2019

ENGINEERING MATHEMATICS-1

(Common to All)

Time: 3 hours Max. Marks: 60

PART-A

(Answer all the Questions **5 x 2 = 10** Marks)

1 a Find the Eigen Values of $A=\begin{bmatrix}-2 & 2 & -3\\ 2 & 1 & -6\\ -1 & -2 & 0\end{bmatrix}$. 2M

b State the Rolle's theorem. 2M

c Evaluate $lim_{(x,y)\to(0,0)}\frac{xy}{x^2+y^2}$. 2M

d Test for convergence the series $\sum\frac{n^3}{3^n}$. 2M

e Find the Fourier coefficient a_0 when $f(x)=|\sin x|, -\pi<x<\pi$. 2M

PART-B

(Answer all Five Units 5 x 10 = 50 Marks)

UNIT-I

2 Diagonalise the matrix $A=\begin{bmatrix}1 & 1 & 1\\ 0 & 2 & 1\\ -4 & 4 & 3\end{bmatrix}$ and hence find A^4. 10M

OR

3 Reduce the quadratic form $3x^2+5y^2+3z^2-2yz+2zx-2xy$ into the canonical form by Orthogonal transformation. 10M

UNIT-II

4 a Prove that $\int_0^\infty e^{-x^2}dx=\frac{\sqrt{\pi}}{2}$. 5M

b Prove that $\beta(m,n)=2\int_0^{\frac{\pi}{2}}\sin^{2m-1}\theta.\cos^{2n-1}\theta\, d\theta$. 5M

OR

5 a Verify Rolle's theorem for $\frac{\sin x}{e^x}$ in $(0,\pi)$. 5M

b Verify Lagrange's mean value theorem for $f(x)=x(x-1)(x-2)$ in $\left(0,\frac{1}{2}\right)$. 5M

UNIT-III

6 a If $U=log(x^3+y^3+z^3-3xyz)$ prove that $\left(\frac{\partial}{\partial x}+\frac{\partial}{\partial y}+\frac{\partial}{\partial z}\right)^2U=\frac{-9}{(X+Y+Z)^2}$. 5M

b Examine the function for extreme values $f(x,y)=x^4+y^4-2x^2+4xy-2y^2$ (x>0,y>0). 5M

OR

7 a Find the directional derivative of $\phi=5x^2y-5y^2z+2.5z^2x$ at the point (1, 1, 1) in the direction of the line $\frac{x-1}{2}=\frac{y-3}{-2}=z$. 5M

b Show that $\nabla^2\left(r^n\right)=n(n+1)r^{n-2}$. 5M

UNIT-IV

8 Discuss the convergence of the series (i) $\frac{1}{1.2.3}+\frac{3}{2.3.4}+\frac{5}{3.4.5}+---$ 10M

(ii) $\sum_{n=1}^{\infty}\frac{n!}{\left(n^n\right)^2}$.

OR

9 Discuss the nature of the series (i) $\sum\frac{1}{n}sin\left(\frac{1}{n}\right)$ 10M

(ii) $\sum_{1}^{\infty}\frac{(log\,n)^2}{n^{3/2}}$.

UNIT-V

10 Find the half range Fourier sine series of $f(x)=x(\pi-x), 0\le x\le\pi$ and hence deduce that $\sum\frac{1}{n^4}=\frac{\pi^4}{90}$. 10M

OR

11 Obtain the Fourier expansion of $f(x)=x\,sin(x)$ as a cosine series in $(0,\pi)$. Hence show that $\frac{1}{1.3}-\frac{1}{3.5}+\frac{1}{5.7}-...==\frac{\pi-2}{4}$. 10M

END