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

Reg. No:

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR

(AUTONOMOUS)

B.Tech I Year I Semester Supplementary Examinations November-2020

MATHEMATICS-I

(Common to All)

Time: 3 hours Max. Marks: 60

PART-A

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

1 **a** Find the Rank of $A = \begin{bmatrix} 1 & 2 & 1 \\ -1 & 0 & 2 \\ 2 & 1 & -3 \end{bmatrix}$ **2M**

b State Lagrange's Mean Value theorem. **2M**

c Define Curl of a vector. **2M**

d Define Convergence and Divergence of a Sequence. **2M**

e Find the Fourier constant a_0 for $f(x) = 1 - x^2$ in $[-1,1]$. **2M**

PART-B

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

UNIT-I

2 **a** Express the Matrix as a sum of Symmetric and Skew-Symmetric matrix, **5M**

$A = \begin{bmatrix} 3 & -2 & -6 \\ 2 & 7 & -1 \\ 5 & 4 & 0 \end{bmatrix}$

b Determine the Eigen Values of A^{-1} where $A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$ **5M**

OR

3 Verify Cayley – Hamilton theorem $A = \begin{bmatrix} 8 & -8 & 2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$ **10M**

UNIT-II

4 **a** Find the volume of the reel-shaped solid formed by the revolution about the y- axis, of the part of the parabola $y^2 = 4ax$ cut off by the latus- rectum. **5M**

b verify Cauchy's mean value theorem for the function sin x and cos x in the interval $[0, \pi/2]$ **5M**

OR

5 **a** Evaluate $\int_0^1 x^2 \left(\log \frac{1}{x}\right)^3 dx$ **5M**

b Express the polynomial $2x^3 + 7x^2 + x - 6$ in powers of (x-2) by Taylor's Series **5M**

UNIT-III

6 **a** If $z = xy^2 + x^2y$ where $x = at^2$, $y = 2at$, find $\frac{dz}{dt}$ **5M**

b Find the minimum value of $x^2 + y^2 + z^2$, given that $x + y + z = 3a$ **5M**

OR

7 Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $z = x^2 + y^2 - 3$ at the point (2, −1. 2) **10M**

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UNIT-IV

8 **a** Test for Convergence of the series $\frac{1}{1.2.3}+\frac{3}{2.3.4}+\frac{5}{3.4.5}+\ldots\ldots$ 5M

b Test for Convergence of the series $\sum\left(1+\frac{1}{\sqrt{n}}\right)^{-n^2}$ 5M

OR

9 State the value of x. for which the following series converge 10M

$$x-\frac{x^2}{2}+\frac{x^3}{3}-\frac{x^4}{4}+\ldots\ldots$$

UNIT-V

10 Expand the function $f(x)=x^2$ as a Fourier series in $[-\pi,\pi]$ and hence deduce that 10M

(i) $\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+\ldots..=\frac{\pi^2}{12}$

(ii) $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\frac{1}{4^2}+\ldots..=\frac{\pi^2}{6}$

OR

11 **a** Find half range Sine Series of $f(x) = x^2$ on $0 < x < 4$ 5M

b Find half range Cosine series of $f(x) = x(2-x)$ in $0 \le x \le 2$ 5M

END