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

B.Tech I Year I Semester Supplementary Examinations Feb-2021

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 $x = a t^2$, $y = 2at$, 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

UNIT-IV

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

b Test for Convergence of the series $\sum \left(1 + \frac{1}{\sqrt{n}}\right)^{-n^{\frac{3}{2}}}$ 5M

OR

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

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

UNIT-V

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

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

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

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 $0 \leq x \leq 2$ 5M

END