SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
B.Tech I Year I Semester Supplementary Examinations June-2024
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 Eigen values of the matrix

$$\begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$$

 CO1 L2 2M

   b State Lagrange's mean value theorem. CO2 L1 2M

   c Evaluate $\lim\limits_{(x,y) \to (0,0)} \dfrac{xy}{(x^2 + y^2)}$ CO3 L2 2M

   d Test the convergence of the series $\sum\limits_{n=1}^{\infty} \dfrac{1}{n+3}$ CO4 L2 2M

   e Calculate a_0, if $f(x) = x\sin x$ in $(0,\pi)$ CO5 L1 2M

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

UNIT-I

2 a Find the rank of a matrix $A = \begin{bmatrix} 1 & 2 & 1 \\ -1 & 0 & 2 \\ 2 & 1 & -3 \end{bmatrix}$ CO1 L2 5M

   b Test for consistency the set of equations and solve them if consistent. CO1 L3 5M
      $5x + 3y + 7z = 4$, $3x + 26y + 2z = 9$, $7x + 2y + 10z = 5$

OR

3 a State Cayley-Hamilton theorem. CO1 L1 2M

   b Show that the matrix $A = \begin{bmatrix} 1 & -2 & 2 \\ 1 & -2 & 3 \\ 0 & -1 & 2 \end{bmatrix}$ satisfies its characteristic equation. CO1 L3 8M

UNIT-II

4 a Find the surface area generated by the revolution of an arc of (catenary) curve $y = c.\cosh\dfrac{x}{c}$ from $x = 0$ to $x = c$ about the $x - axis$ CO2 L2 5M

   b Find the volume of the reel-shaped solid formed by the revolution about the y- axis, $y^2 = 4ax$ of the part of the parabola cut off by the latus-rectum CO2 L2 5M

OR

5 a Find the value of $\Gamma\left(\dfrac{1}{2}\right)$ CO2 L3 5M

   b Verify lagrange's mean value theorem for $f(x) = x^3 - x^2 - 5x + 3$ in $[0,4]$ CO2 L2 5M

UNIT-III

6 a If $z = xy^2 + x^2 y$; where $x = at^2$, $y = 2at$, find $\dfrac{dz}{dt}$ as a total derivative.   **CO3 L2 5M**

b Examine the function for extreme values   **CO3 L3 5M**
$f(x, y) = x^4 + y^4 - 2x^2 + 4xy - 2y^2$; $(x > 0, y > 0)$

OR

7 a Find a point on the plane $3x + 2y + z - 12 = 0$ which is nearest to the origin.   **CO3 L3 6M**

b Find $curl\ \vec{f}$ where $\vec{f} = grad(x^2 + y^2 + z^2 - 3xyz)$ **CO3 L3 4M**

UNIT-IV

8 Examine the following sequences for convergence: **CO4 L3 10M**

(i) $a_n = \dfrac{n^2 - 2n}{3n^2 + n}$ and (ii) $a_n = 3 + (-1)^n$

OR

9 a Discuss the convergence of the series $\sum \dfrac{1}{\sqrt{n}} \tan \dfrac{1}{n}$ **CO4 L3 5M**

b Test whether the series converges or diverges $\sum\limits_{n=1}^{\infty} \dfrac{(2n+3)(2^n + 3)}{3^n + 2}$ **CO4 L3 5M**

UNIT-V

10 a Find the Fourier series of the function $f(x) = x^2, -\pi \le x \le \pi$ **CO5 L2 5M**

b Find the Fourier series of the function $f(x) = e^x, -\pi \le x \le \pi$ **CO5 L2 5M**

OR

11 a Find half-range fourier cosine series for $f(x) = (x-1)^2$ in $0 < x < 1$.   **CO5 L3 5M**

b Expand $f(x) = x \cos x$ as a sine series in the interval $0 < x < \pi$ **CO5 L3 5M**

*** END ***