

VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY
(VSSUT), ODISHA

ODD Mid Semester Examination for session 2024-25
B Tech (All Branches) 1st Semester.

Subject- MATHEMATICS- I

Full Mark-30

Time-90 Minutes

Answer All Questions.

The figure on the right hand margin indicates marks. Symbols carry usual meaning.

1. Answer the following questions. [2 × 3]

a). Find length of curve $y = \log \sec x$, $x = 0$ to $x = \frac{\pi}{3}$. -CO1

b) Find the value of $\Gamma(9/2)$ -CO2

c) Test convergence of $\int_1^{\infty} \frac{dx}{x}$. -CO3

2. [4 + 4]

a) A line $x = 1-y$, $0 \leq y \leq 1$ revolved about y-axis to generate cone. Find its lateral surface area. -CO1

b) Test convergence of $\int_a^{\infty} \frac{\sin^2 x}{x^2} dx$ -CO1

OR

(a) The region bounded by $y = \sqrt{x}$, x-axis and line $x=y$ revolved about y-axis. Find volume of the solid. -CO1

(b) . Test convergence of $\int_1^{\infty} \frac{dx}{x^{\frac{1}{2}} \left(1+x^{\frac{1}{2}}\right)}$. -CO1

3. [4 + 4]

(a) Find Local maxima and Local minima of

$$f(x) = \sin^4 x + \cos^4 x, 0 < x < \frac{\pi}{2}, \quad \text{-CO2}$$

(b) Using gamma function evaluate $\int_0^1 \frac{1}{\sqrt{-\log x}} dx$. -CO2

OR

(a) Verify Mean value theorem for $y = \sqrt{x-2}$, [2,3]. -CO2

(b) Using relation between beta and gamma function prove that $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$. -CO2

4. [4 + 4]

(a). Find Taylor series of $f(x) = e^{-x}$, $x = -4$. -CO3

(b) Test convergence of $\int_a^\infty \frac{\sin x}{\sqrt{x}}$ -CO3

OR

(a). Find Maclaurin series of $f(x) = \cos 2x$. -CO3

(b) If $u = e^{a\theta} \cos(a \ln r)$, then Prove that $u_{rr} + \frac{1}{r}u_r + \frac{1}{r^2}u_{\theta\theta} = 0$. CO3