

ODD Mid Semester Examination for session 2025-26

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 $x = 5 \cos^3 2t, y = 5 \sin^3 2t, 0 \leq t \leq \pi/2$

-CO1

b) Find value of $\Gamma\left(\frac{13}{2}\right)$ applying properties of gamma function.

-CO2

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

-CO1

2.

[4 + 4]

a) Find the surface area generated by revolving curve $y = x^3, 0 \leq x \leq 1$ about X-axis.

-CO1

b) Test the convergence of $\int_1^\infty \frac{4\cos^3 x - 3\cos x}{x^3} dx$

-CO1

OR

(a) The region bounded by $y = \sqrt{9-x^2}$ and x-axis revolved about x-axis. Find volume of the solid.

-CO1

(b) Test the convergence of $\int_1^\infty \frac{(1+e^x)\sin x}{x^3} dx$

-CO1

3.

[4 + 4]

(a) Find the local maxima and local minima of $f(x) = (x-2)^4(x+1)^4$

-CO2

(b) Prove that $\Gamma(n+1) = n\Gamma(n)$.

-CO2

OR

(a) State Rolle's theorem and discuss suitability of Rolle's theorem to find point on the curve $y = \cos 2x - 1$ in $[\pi/2, 5\pi/2]$ at which tangent is parallel to x-axis.

(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 $f(x) = e^{-2x}\cos 3x$, about point $x = \pi$.

-CO2

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

-CO1

OR

(a). Find the Maclaurin series of $f(x) = \sin 5x + \cos 5x$.

-CO2

(b) Evaluate $\int_0^\infty e^{2ax-x^2} dx$ using gamma function.

-CO1