

IIIT, Sricity  
Mathematics - II (Calculus)  
Assignment - I

1. Evaluate the following improper integrals and discuss about its kind and convergence.

(a)  $\int_0^1 x \ln^2 x \, dx$

(b)  $\int_{-\infty}^{\infty} x e^{-x^2} \, dx$

2. Using comparison test, find the convergence of the improper integral.

$$\int_1^{\infty} \frac{1+2\sin^2 x}{\sqrt{x}} \, dx$$

3. Use quotient test and find its convergence.

$$\int_0^1 \frac{\sin x}{x^3} \, dx$$

4. Evaluate the integral using  $\Gamma$  function

$$\int_0^1 x^4 \left(\log \frac{1}{x}\right)^3 \, dx$$

5. Using Beta function. Show that

$$B(m, n) = 2 \int_0^{\pi/2} \sin^{2m-1} \theta \cos^{2n-1} \theta \, d\theta \quad \text{and}$$

using above relation evaluate  $\int_0^{\pi/2} \sin^{7/2} \theta \cos^{3/2} \theta \, d\theta$ .