Kapil
1st semester

Plese write your Roll. No. immediately .....

## First term Examination(B. Tech )

## September 2017

**Max. Time :1hour 30min.** **Max. Marks: 30**

**Sub. Code:ETMA-101** **Sub. Name:Applied Mathematics-I**

**Note: Attempt Q. No. 1 and two more Questions**

**1.**(a) State Leibnitz's test for convergence with an example. (3)

**1.**(b) Find $n^{th}$ derivative of the following function : $y = x^4/\{(x-1)(x-2)\}$ (3)

**1.**(c) Find the radius of curvature at the point $\left(\frac{1}{4}, \frac{1}{4}\right)$ of the curve : $y^2 = 4ax$ (2)

**1.**(d) Find Taylor series expansion of the function $f(x) = x^3+3x^2 + 15x - 10$ in power of $(x-1)$. (2)

**2.**(a) If $Un = \frac{d^n}{dx^n}(x^n \log x)$, prove that $U_n = (n-1)! + n\,U_{n-1}$ $(n = 1, 2, ....)$.

Hence deduce that $Un = n!\,[\log x + 1 + \frac{1}{2} + \frac{1}{3} + .... + \frac{1}{n}]$ $(n = 1, 2, .....)$. (5)

**2.**(b) Test the nature of the series $\frac{1x^3}{2.3} + \frac{1.3x^5}{2.4.5} + \frac{1.3.5x^7}{2.4.6.7} + .....$ (5)

**3.**(a) Using the expansion of tan (x+h) ,compute tan 46º correct to 4 significant figures. (5)

**3.**(b) Find all the asymptotes of the curve : $x^3+x^2y-xy^2-y^3+x^2-y^2=2$ (5)

**4.**(a)Trace the curve $x^3 + y^3 = 3axy$ , ( a>0) (5)

OR If $U_n = \int_0^{\pi/2} x^n \sin x\,dx$ and n > 1, show that $U_n + n(n-1)\,U_{n-2} = n\left(\frac{1}{2}\pi\right)^{n-1}$

**4.**(b) In the cycloid x=a (θ+sin θ), y=a(1-cosθ) prove that $\rho = 4a\cos\frac{1}{2}\theta$ (5)