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Roll No. DTU/11/6719

FIRST SEMESTER

B.Tech. (ALL)

MID SEMESTER EXAMINATION ***September-2011***

AM-101 MATHEMATICS-I

Time: 1 Hour 30 Minutes ***Max. Marks : 20***

Note : Answer any ***FIVE*** questions out of the eight set.
All questions carry ***EQUAL*** marks.
Assume suitable missing data, if any.

1 State and prove the necessary condition for the convergence of an infinite series with positive terms. Is it sufficient also? Justify your answer.

2 Test the following series for their convergence

(i) $\sum \frac{\sqrt{n+1}-\sqrt{n}}{n^p}$, $p>\frac{1}{2}$ (ii) $\sum \frac{x^n}{1+x^n}; x>0$

3 Discuss the convergence of series

$$\frac{x}{1}+\frac{1.x^3}{2.3}+\frac{1.3.x^5}{2.4.5}+\frac{1.3.5.}{2.4.6.}\frac{x^7}{7}+\ldots\ldots(x>0)$$

4 Show that absolute convergence implies convergence but converse is not true. Test for the convergence of the series

$$\sum_{n=1}^{\infty}(-1)^n\frac{Cos\ nx}{n^2}.$$

5 Expand $\tan\left(x+\frac{\pi}{4}\right)$ as for as the term x^4. Hence find the value of tan 47° correct upto four decimal points.

6 Show that

$$Sin^{-1}x = x+\frac{1}{2}\cdot\frac{x^3}{3}+\frac{1.3}{2.4}\cdot\frac{x^5}{5}+\frac{1.3.5}{2.4.6}\cdot\frac{x^7}{7}+\ldots\ldots$$

and hence find π correct up to three decimal places.

7 Define the curvature of a curve at an arbitory point P. Show that the curvature of a circle is constant. Find the curvature at θ = 0 for the cycloid

$$x=a(\theta+\sin\theta),\ y=a(1-\cos\theta)$$

8 If P_1 and P_2 are the radii of curvatures at the extremeties of a focal chord of the parabola $y^2 = 4ax$, then prove that

$$\rho_1^{-2/3}+\rho_2^{-2/3}=(2a)^{-2/3}.$$

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