



EASTERN UNIVERSITY, SRI LANKA

DEPARTMENT OF MATHEMATICS

EXTERNAL DEGREE EXAMINATION IN SCIENCE -2004/2005

SECOND YEAR, SECOND SEMESTER (Jan./Apr., 2011)

EXTMT 205 - DIFFERENTIAL GEOMETRY

(PROPER & REPEAT)

Answer all Questions

Time: One hour

1. State the *Frenet – Serret* formula.

(a) Let C be a curve with constant torsion at any point P on the curve. Point Q is taken at a constant distance c from the point P on the binormal to the curve C at P . Show that the angle between the binormal to the locus of Q and the binormal of the given curve is

$$\tan^{-1} \left(\frac{c\tau^2}{\kappa\sqrt{1 + c^2\tau^2}} \right).$$

(b) Prove with the usual notations that the necessary and sufficient condition for a curve to be a helix is that $\frac{\tau}{\kappa}$ is constant.

2. Define the terms *involute* and *evolute* of a curve.

(a) With the usual notations show that the equation of *involute* of the curve $C : \underline{r} = \underline{r}(s)$ is given by

$$\underline{R} = \underline{r} + (c - s)\underline{t},$$

where c is a constant.

(b) Find the *involute* and *evolute* of the cubic curve given by

$$\underline{r}(u) = (3u, 3u^2, 2u^3).$$