



EASTERN UNIVERSITY, SRI LANKA  
SECOND EXAMINATION IN SCIENCE - 2004/2005  
SECOND SEMESTER (Oct./ Nov., 2006)  
MT 205 - DIFFERENTIAL GEOMETRY  
Proper & Repeat

Answer all questions

Time : One hour

1. State and prove Serret-Frenet formula.

Let  $\Gamma$  be a curve of constant torsion  $\tau$  and let a point  $Q$  be at a constant distance  $c$  from the point  $P$  on  $\Gamma$  on the binormal to  $\Gamma$  at  $P$ . Show that the angle between the binormal to the locus of  $Q$  and the binormal to the given curve  $\Gamma$  is  $\tan^{-1} \frac{c\tau^2}{\kappa\sqrt{1+c^2\tau^2}}$ , where  $\kappa$  is the curvature of the curve  $\Gamma$  at  $P$ .

2. What is meant by saying that a curve is helix?

Prove, with the usual notations, that a necessary and sufficient condition for a helix is that  $\frac{\tau}{\kappa}$  is constant.

Show that the curve  $r(\theta) = (a \cos \theta, a \sin \theta, a\theta \cot \beta)$  is a helix, where  $a$  is a constant.