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**University Examinations 2014/2015**

FOURTH YEAR, FIRST SEMESTER EXAMINATION FOR DEGREE OF BACHELORS IN MATHEMATICS AND COMPUTER SCIENCE.

**SMA 2420: DIFFERENTIAL GEOMETRY**

**DATE: DECEMBER 2014 TIME: 2 HOURS**

**INSTRUCTIONS:** *Answer question* ***one*** *and any other* ***two*** *questions*

**QUESTION ONE (30 MARKS)**

1. Explain each of the following;
2. Linearly dependent vectors (1 mark)
3. Curvative vector of the curve (1 mark)
4. Osculating plane (1 mark)
5. Given the vector=-+, =2++2and , verify that (4 marks)
6. The position vector of a particle in space at time t is given by

. Find the angle between the velocity and acceleration vectors at time t=0 (4 marks)

1. Show that the locus of the curve of curvative is an evolute only when the curve is a plane curve (4 marks)
2. Define the term ‘vectifiable arc’ and hence compute the length of the arc (5 marks)
3. Find the parametric equation of a line through the vector =parallel to both vectors =- and =+ (3 marks)
4. Show that the curve generated by lies on the plane  and normal to (4 marks)
5. If =(t) is a regular parametric representation on the interval I, proof that for all there exists a neighbourhood or to in which x is one to one. (3 marks)

**QUESTION TWO (20 MARKS)**

1. given the curve , find the equation of the tangent line and the normal plane at (6 marks)
2. Define a regular representation of a curve and show that the representation is regular. (6 marks)
3. Find the equation of the principal normal line at the point on the helix  (8 marks)

**QUESTION THREE (20 MARKS)**

1. Show that the arc length of a curve on the surface

)  is given by

 (5 marks)

1. Find the second fundamental form on the surface  (8 marks)
2. Show that if the space curve x=x(s) has a constant tortion then the curve has a constant curvative (7 marks)

**QUESTION FOUR (20 MARKS)**

1. show that the equation =(u+v)e1+(u-v)e2+(u2+v2)e3 defines a mapping of the uv-plane on the elliptic paraboloid x3=(+ and hence u-parameter and v-parameter curves

1. Find the equation of the binomial line and the rectifying plane along the curve

= (3t-t3)e1+3t2e2+(3t+t3)e3 at the point t=1

1. Find the curvative vector k and the curvative k on the curve =te1+t2e2+t3e3 at the point t=1