TIME: 90 min
M - 107

KING SAUD UNIVERSITY
DEPARTMENT OF MATHEMATICS
II MID TERM EXAM (SEM I) 1435-1436

FULL MARKS:50

Question: 1. (a) Given $P(1,1,1)$, $Q(1,2,1)$ and $R(1,0,-1)$,

(i) Find the angle between QR and QP.

(ii) Find the distance from Q to the line through P and R.

[5+5+5] (b) Find the equation of the plane containing points $A(1,-1,1)$, $B(2,0,1)$ and $C(-1,2,3)$.

Question: 2 . (a) Let $\vec{A} = <0,-1,0>$, $\vec{B} = <2,0,1>$ and $\vec{C} = <x,y,z>$, find the vector $\vec{C}$ and scalar m satisfying $\vec{A}.\vec{C} = 3$ and $\vec{A}\times\vec{C} = m\vec{A} + \vec{B}$.

[6+5+6]

(b)Identify the surface $x^2 + 4y^2 = 2z^2$. Find its traces on the coordinate planes and sketch the surface.

(c) Find Unit Tangent vector, Principal Normal vector and the curvature of the curve determined by $r(t) = <3\cos t,\ 3\sin t,\ t>$ at the point r(0).

Question: 3. (a) Find the parametric equations of tangent to curve C

[4+6+8] $r(t) = \cosh t\,i + \sinh t\,j + (t^2+1)k$, at $r(0)$.

(b) If the acceleration of a moving particle is given by $a(t) = 6ti - 12t^2 j + k$, find the object's velocity and position given that the initial velocity is $v(0) = 2i - 3j + k$, and the initial position is $r(0) = 2j$.

(c) If the position vector of an object is $r(t) = 3ti + t^3 j + 3t^2 k$, find the general formula for the tangential and normal components of acceleration and for the curvature of the curve C .