

TIME: 90 min
M - 107

KING SAUD UNIVERSITY
DEPARTMENT OF MATHEMATICS
II MID TERM EXAM (SEM II) 1433-1434

FULL MARKS:40

- Question: 1. (a) Find terminal point of the vector $\langle 5, -2, -1 \rangle$, when initial point $(3, -2, 1)$ is given.
[2+3+5] (b) Determine the value of k that satisfies $\|ku = 6\|$ where $u = \langle 1, 3, 5 \rangle$
(c) Show that the quadrilateral with vertices $P(4, 1, -1)$, $Q(1, 5, 0)$, $R(1, 3, 6)$ and $S(4, -1, 5)$ is a parallelogram and find its area..

- Question: 2 . (a) Find the equation of the plane containing intersecting lines:

[7+7]
$$x = -1 + t, \quad y = 2 + t, \quad z = 1 - t \quad \text{and}$$
$$x = 1 - 4s, \quad y = 1 + 2s, \quad z = 2 - 2s$$

- (b) Find the distance between the skew lines l_1 and l_2 , where l_1 passes through the points $A(1, -2, 3)$ and $B(2, 0, 5)$ and l_2 passes through the points $C(4, 1, -1)$ and $D(-2, 3, 4)$.

- Question: 3. (a) If the acceleration of an object is given by

[6+6+4]
$$a(t) = i + 2j + 6tk .$$

Find the velocity, and position functions given that initial velocity is

$$v(0) = j - k \quad \text{and initial position is } r(0) = i - 2j + 3k$$

- (b) The position vector of a moving point at time t is given by

$$r(t) = 2 \sin ti + 5tj + 2 \cos tk .$$

Find the Unit tangent vector and Principal normal vector of the curve at time t .

Also find its curvature.

- (c) Show that if $r(t)$ is vector valued function and $\frac{d^2r}{dt^2}$ exists, then

$$\frac{d}{dt} [r(t) \times r'(t)] = r(t) \times r''(t)$$