

**MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY**

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**University Examinations 2015/2016**

SECOND YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF TECHNOLOGY IN ELECTRICAL, CIVIL AND MECHANICAL ENGINEERING

**SME 3200: ENGINEERING MATHEMATICS III**

**DATE: November, 2015 TIME:** $2 $**HOURS**

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

**QUESTION ONE - (30 MARKS)**

1. Find equation of perpendicular bisector of line segment from A(3,9) to B(-1,4).

(4 Marks)

1. Determine the vector having the initial point p(2,7,-5) and the terminal point Q(0,-3,2) and find the unit vector having the same direction. (4 Marks)
2. Find the centre and the radius of circle whose equation is given by

$x^{2}+y^{2}+6x+4y+9=0$ hence sketch the circle. (4 Marks)

1. For the parabola whose equation is given by 4x +$4y^{2}+12=0$ Find the vertex, focus and directrix. (5 Marks)
2. A particle moves along a curve whose parametric equations are

$x=2e^{-3t}, y=3\cos(4t, z=3Sin 5t )$where t is the time.

1. Find its velocity and acceleration at time t. (3 Marks)
2. Find the magnitude of velocity and acceleration at t = 0 (2 Marks)
3. Find the equation of ellipse with Foci (1,0) and (0.5) and vertices (0 ,-1) and (0,7)

(4 Marks)

1. Three forces A B and C are acting on object. If $\vec{A}$ = 2i – j+k, B = i+j+2k c = 3i +2j+4k, Find the magnitude of the resultant force. (4 Marks)

**QUESTION TWO (20 MARKS)**

1. Sketch the graph of $y=\cos(h)x$ and $y=\sin(hx )$ (5 Marks)
2. Prove the following hyperbolic formulas.
3. cos $h^{2}x-Sin h^{2}x=1$ (5 Marks)
4. Cos h 2x = Cos $h^{2}x+Sin h^{2}x $ (5 Marks)
5. Tan hx = $\frac{e^{2x}- 1}{e^{2x}+1}$ (5 Marks)

**QUESTION THREE ( 20 MARKS)**

1. Find a parametric equation of a straight line passing through.
2. A (2,3) and (1,7) (4 Marks)
3. P(1 3 -2) and Q (4,2,6) (4 Marks)
4. Find equation of tangent to the circle given by equation $x^{2}+y^{2}=9$ at a point on the first quadrant when x= 2 (6 Marks)
5. Find the distance of the point (3, -5) and the line 4x – 3y = 24 (6 Marks)

**QUESTION FOUR ( 20 MARKS)**

1. Find the area of triangle ABC if $\vec{AB}$ = 2i – j-6k and $\vec{AC}$ = i+ 3j –k (6 Marks)
2. A particle travels so that its acceleration is given by $a=2e^{-t}i+5costj-3\sin(t) k $.If the particle is at (1 -3, 2) at time t=0 and is moving with velocity given by 4i-3j+2k.Find
3. the velocity at any time t (3 Marks)
4. the displacement of the particle (5 Marks)
5. a particle of unit mass moves in force field given by F= ($3t^{2}- 4t) i+\left(12t-6\right)j+\left(6t-12t^{2}\right)k$ where t is time.

Find the change in momentum of the particle from time t=1 to t = 2. (5 Marks)

**QUESTION FIVE (15 MARKS)**

1. For the hyperbola whose equation is given by$ \frac{\left(x-3\right)^{2}}{25}$ – $\frac{\left(y+1\right)}{49}$ = 1, find vertices, foci, centre and the asymptotes, hence sketch the hyperbola. (10 Marks)
2. Write the equation of plane described by the following;
3. Through the points P1(3 -2,4) P2(3 2 -6) and P3 (1, 5, -3) (5 Marks)
4. perpendicular to n = $<$ 2,3,5$>$ and through P (1, -3,7) (5 Marks)