(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2016/2017 ACADEMIC YEAR

FIRST YEAR FIRST SEMESTER

SPECIAL/SUPPLEMENTARY EXAMINATION

FOR THE DIPLOMA IN EDUCATION

MATHEMATICS

COURSE CODE: **EDM 106**

COURSE TITLE: GEOMETRY, TRIGONOMETRY AND VECTORS I

DATE: 19/09/17 **TIME:** 8.00 AM- 10.00 AM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

QUESTION ONE (28 MARKS)

a) Verify that the point (1,2) lies on the circle $x^2+y^2-6x+4y-7=0$ and find the equation of the tangent at this point. (4mks)

b) Solve the equation $\sin(3\mu+20)^\circ = \cos 4\mu$ (3mks)

c) Solve the equation $2\sin 2\lambda-4\cos\lambda=4$, for $-180\leq\lambda\leq180$ (4mks)

d) If A and B are the points (1,1,1) and (13,4,5) respectively, find in terms of **i**, **j** and **k**, the displacement vector **AB**. Hence find the unit vector parallel to vector **AB**. (4mks)

e) Show that the points A(1,2,3),B(3,8,1),C(7,20,-3) are collinear. (3mks)

f) If $x=a\sin\beta$, simplify: $\frac{1}{\sqrt{(a^2-x^2)}}$ (3mks)

g) Prove that $\tan\lambda+\cot\lambda={}^{1}/_{\sin\lambda\cos\lambda}$ (3mks)

h) Solve the equation $1+\cos\theta=2\sin^2\theta$ for $0^\circ\leq\theta\leq360^\circ$ (4mks)

QUESTION TWO (16 MKS)

a) Find the equation of the common cord to the two circles $x^2+y^2-14x+2y+40=0$ and $x^2+y^2-2x-4y-20=0$ and hence find the coordinates of the points of intersection of the two circles. (4mks)

b) A variable point P moves on the curve $y^2=4x$ and A is the point (1,0). Find the locus of the mid-point of AP. (4mks)

c) Show that the equation of the circle on the line segment joining A(3,-5) and B(2,6) as a diameter is $(x-3)(x-2)+(y+5)(y-6)=0$. (4mks)

d) Find the equation of the locus of a point P which moves so that it is equidistant from two fixed points A and B whose coordinates are (3,2)and(5,-1). (4mks)

QUESTION THREE (16 MKS)

a) If $\sin(x+\propto)=2\cos(x-\propto)$, prove that

$$\tan x=\frac{2-\tan\propto}{1-2\tan\propto},$$ (5mks)

b) Prove that: $\sin 3A=3\sin A-4\sin^3 A$ (4mks)

c) If $\sin(x+\alpha)=\cos(x-\beta)$, find tanx in terms of α and β. (4mks)

d) If $\sin A=\frac{4}{5}$ and $\cos B=\frac{12}{13}$, where A is obtuse and B is acute, find the value of tan(A+B). (3mks)

QUESTION FOUR (16 MKS)

a) Given the equation of the line $\frac{x-2}{3}=\frac{y-4}{5}=\frac{z-7}{2}$, express the equation in the form **r=a+tu,** where t is the parameter and r,a and **u** are vectors and show that the point (8,14,11) is on the line. (3mks)

b) At noon, two boats P and Q are at points whose position vectors are **4i+8j**and **4i+3j**respectively. Both boats are moving with constant velocity; the velocity of P is **4i+j**and the velocity of Q is **2i+5j** (all the distances are in kilometers and the time in hours).

i) Find the position vectors of P and Q after t hours. (2mks)

ii) Find vector **PQ** after t hours. (2mks)

iii) Hence or otherwise express the distance PQ between the boats in terms of t.(2mks)

iv) Show that the least distance between the boats is $\sqrt{5}km$. (2mks)

c) In a triangle OAB, X is a point on OB such that **OX=2XB** and Y is a point on AB such that 2BY=3YA.

i) Express x and y in terms of **a** and **b**. (2mks)

ii) Find the position vector of any point on XY and hence find the position vector of point Z, where XY produced meets OA produced. (3mks)

QUESTION FIVE (16 MKS)

a) In a triangle XYZ, XY=7cm, YZ=9cm and XZ=6.5cm. Calculate to two decimal places:

i) the size of the largest angle. (5mks)

ii) the area of the triangle (3mks)

b) i) Find the parametric equation of the line that passes through the points (4,-3,5) and (5,1,3). (4mks)

ii) Given that A(1,2,1), B(4,7,8), C(6,4,12) and D(3,-1,5) are the vertices of a parallelogram, determine the area of the parallelogram. (4mks)