MURANG'A UNIVERSITY COLLEGE

(A Constituent College of Jomo Kenyatta University of Agriculture and Technology)

DEPARTMENT OF APPLIED SCIENCES

END OF SEMESTER EXAMS UNIT CODE: SMB0102 DATE: May 2015

SUBJECT: GEOMETRY CLASS: BRIDGING MATHEMATICS TIME: 2 HOURS

INSTRUCTIONS

ANSWER QUESTION **ONE (COMPULSORY)** AND ANY OTHER **TWO** QUESTIONS

QUESTION ONE (30 MARKS)

(a) Without using calculators or tables

(i) obtain tan 240° leaving your answer in surd form. (3 marks)

(ii) solve for θ, $0 < \theta < 360°$ if $2\sin 3\theta + 1 = 0$. (3 mks)

(b) A triangle XYZ has angle$< XYZ = 40° \; and \; < YZX = 100°$. By calculating $< ZXY$,

(i) state what type of a triangle XYZ is. (2 mks)

(ii) state which sides are equal if such sides exist in triangle XYZ. (1 mk)

(c) A regular polygon has each interior angle greater by 90° than each exterior angle. What type of the polygon is this? (4 mks)

(d) Without using a protractor draw a triangle PQR with PQ = 6 cm, angle PQR = 75°, PR = 7.5 cm and angle PRQ is acute. Measure QR and angle QPR. (4 mks)

(e) Joel whose height is 2.1 m observes his shadow to be 5 m on the horizontal ground. Calculate the angle of elevation to the sun at that time. (3 mks)

(f) The interior angles of a hexagon are $2x, \frac{1}{2}x, x + 40°, 110°, 130° \; and \; 160°$. Calculate the size of the smallest angle. (4 mks)

(g) Construct without using a set square or protractor a parallelogram ABCD with AB = 6 cm, BC = 9 cm and angle ABC = 105°. Drop a perpendicular from D to AB and hence calculate the area of the parallelogram. (3 mks)

(h) Alice walks from a point A on a bearing of 30° for 5 km and then walks due south to a point 8 km from A. Calculate:

i. Alice's new bearing from A.

ii. Alice's total distance covered. (3 mks)

QUESTION TWO (20 MARKS): OPTIONAL

(a) (i) Without using a protractor or a setsquare, draw a pentagon ABCDE with AB = 8 cm, BC = 6 cm, CD = 5.2 cm, angles $< EAB = 150°, < ABC = 120°, < BCD = 135° \; and \; < CDE = 60°$. (8 mks)

(ii) Measure DE and angle $< AED$. (2 mks)

(b) Without using a protractor,

(i) Construct triangle ABC in which BC = 6 cm, AB = 8 cm and <ABC = 135°. Measure <BAC, $< BCA$ and line AC. (5 mks)

(ii) Draw a triangle QRS where QR = 6 cm, $< QRS$ = 60° and <RQS = 30°. Draw the locus of all points equidistant from the three sides of QRS. Mark the locus P and measure the distance from P to the sides of the triangle. (5 mks)

QUESTION THREE (20 MARKS): OPTIONAL

(a) (i) The three angles of a triangle are 2x, 4x +30° and 10x – 10°. Calculate the size of each angle. What type of triangle is this? (3 marks)

(iii) The interior angle of a regular polygon is 160°. How many sides does the polygon have? (2 mks)

(b) Solve the following equations:

(i) Sin(2A +10)° = Cos(3A), $0 \leq A \leq 90°$

(ii) $4\text{Sin}^2 2\theta - 1 = 0$, $0 \leq \theta \leq 360°$ (5 mks)

(c) Solve the following trigonometric equations:

i. $2\sin^2(2\theta + 60°) - \cos 60° = 0$. $0° \leq \theta \leq 180°$

ii. $3\cos^2\theta - 4\cos\theta - 4 = 0$ $-180° \leq \theta \leq 180°$

(8 mks)

(d) Without using tables or calculators, find the value of $\cos(-210°)$ and leave your answer in surd form. (2 mks)

QUESTION FOUR (20 MARKS): OPTIONAL

A right pyramid has a rectangular base ABCD with AB = 12 cm and BC = 16 cm. Point M is the

midpoint of line AB and N is the midpoint of line BC. O is the center of the base ABCD, V is the apex of the pyramid and VO = 15 cm. Calculate:

(a) The length of a slant edge. (3 marks)
(b) The angle between lines AV and VC. (3 marks)
(c) The angle between lines AB and BV. (3 Marks)
(d) The angle between the line VD and the base ABCD. (3 marks)
(e) The angle between the planes ABCD and VBC. (4 marks)
(f) The angle between the planes ABV and VDC. (4 marks)

QUESTION FIVE (20 MARKS): OPTIONAL

(a) Draw a line AB = 10 cm. Draw a circle of radius 4.5 cm centered at B. Draw a tangent from A to point P on the circle you have drawn. (3 Marks)

Measure the length of the tangent and the angle ABP. (2 Marks)

(b) A, B and C are three points on the surface of the earth.

(i) Calculate the distance in nautical miles between $A(40°S, 20°W) and\ B(40°S, 100°W)$ measured along the circle of latitude. (2 Marks)

(ii) Calculate the distance in both kilometers and nautical miles along the circle of latitude between $A(40°S, 20°W) and\ C(40°S, 30°E)$. Take the radius of the earth as 6370 km.

(3 Marks)

(c) An aircraft leaves Nairobi $(1°15'S, 36°49'E)$at 0900 hours and flies due west. At 1900 hours Nairobi time, the plane is above the town $A(1°15'S, 0°49'E)$. Find the speed of the aircraft in:

(i) Km/h (4 Marks)
(ii) Knots. (Take R = 6370 km) (3 Marks)

(d) Given that the locations of Nairobi and New York are $(1°15'S, 36°49'E) and\ (40°45'N, 70°0'W)$ respectively, find the difference in time between the two cities. (3 Marks)