KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2010/2011 ACADEMIC YEAR

FOR THE CERTIFICATE OF BRIDGING MATHEMATICS

COURSE CODE: BMATH 001

COURSE TITLE: GEOMETRY AND VECTORS

STREAM: BRIDGING MATHEMATICS

DAY: FRIDAY

TIME: 9.00 – 11.00 A.M.

DATE: 03/12/2010

INSTRUCTIONS:

Answer **All** questions in section A and any **Two** in section B

PLEASE TURN OVER

SECTION A (30 marks)

1. Define the following terms
   a) Gradient of a line. **[2 marks]**
   b) abscissa **[2 marks]**
2. Find an equation of the line through P(5, - 7) that is parallel to the line $6x + 3y = 4$ **[2 marks]**
3. Suppose a major league baseball player has hit five home runs in the first 14 games and he keeps up this pace throughout the 162-game season
   i. Express the number y of the home runs in terms of the number x of games played. **[1 mark]**
   ii. How many home runs will the player hit for the season? **[2 marks]**
4. Three of the points given lie on a circle whose centre is at the origin, State which points and the radius of the circle. A(-1, 7), B(5, -5), C(-7, 5) and D(7, -1) **[4 marks]**
5. O (0, 0) is the centre of the circle which passes through A (5, 0). **[4 marks]**
   i. Find the equation of the circle
   ii. The point P on the circle has coordinates (4, k) find k
6. Given that $90^0 < \theta < 270^0$, find θ when
   a) $\tan\theta = \sqrt{3}$ **[3 marks]**
   b) $\cos\theta = -\sqrt{3}/2$ **[3 marks]**
7. Given that $\underline{a} = 4\hat{i} + 3\hat{j} + 12\hat{k}$ and $\underline{b} = 8\hat{i} - 6\hat{j}$ find

i. $\underline{a} \bullet \underline{b}$ **[3 Marks]**

ii. The angle between the two vectors $\underline{a}$ and $\underline{b}$ **[4 Marks]**

SECTION B 40 Marks

9.

a) Solve the equation $\tan\theta = 2\sin\theta$ for the values of $0 \le \theta \le 360^0$ **[5 marks]**

b) P, Q, R are the points (5, -3), (-6, 1), (1, 8) respectively. hence
   i. Show that triangle PQR is isosceles **[3 marks]**
   ii. Find the coordinates of the mid point of the base. **[2 marks]**

c) A line is drawn through the point (2, 3) making an angle of 45^0 with the positive direction of the x–axis and it meets the line x = 6 at P. Find the

i. Distance of P from the origin **[4 marks]**

ii. The equation of the line through P perpendicular to OP **[6 marks]**

10.

a) Use the slope-intercept form to find the slope and the y-intercept of the given lines.

i. $2x = 15 - 3y$

ii. $4x - 3y = 9$ **[4 marks]**

b) Simplify the following without using tables..

$$\frac{\sin^2 315^0\left(1-\tan^2 210\right)}{\left(1+\cos 120^0\right)\left(1+\tan^2 330^0\right)}$$ **[6 Marks]**

c) In triangle ABC a = 5 cm, b = 7 cm and c = 9 cm. Calculate angle B and the area of the triangle. **[5 marks]**

d) Given A (-3, 1) and B(5, 4), find the equation of the perpendicular bisector of the line segment AB. **[5 marks]**

11.

a) If the line x = 2y meets the circle $x^2 + y^2 - 8x + 6y - 15 = 0$ at the points P and Q find

i) The co-ordinates of P and Q **[4 marks]**

ii) The equation of the circle passing through P, Q and the point (0, 0) **[5 marks]**

b) AB is a chord of a circle centre O and radius 14 cm. If the angle AOB is 80^0, calculate the perpendicular bisector of the chord AB to the minor arc AB. **[6 marks]**

c) AB is a chord of a circle center O and radius 10 cm. If the perpendicular distance ON, from the center O to the chord is 6 cm, calculate;

i. The length of the chord AB. **[4 marks]**

ii. The area of the minor segment cut off by AB (Take $\pi = 3.14$) **[3 marks]**

12.

a) Given the vectors find $\underline{a} = 2\hat{i} - \hat{j} + 3\hat{k}$, $\underline{b} = 3\hat{i} + 2\hat{j} - 4\hat{k}$ and $\underline{c} = -\hat{i} + 3\hat{j} - 2\hat{k}$ determine

i. $\underline{a} + \underline{b}$ **[2 marks]**

ii. $2\underline{a} + 3\underline{b} - 2\underline{c}$ **[4 marks]**

b) Suppose X lies on ST such that SX:XT = 2:5, express the position vector in terms of the vectors $\underline{s}$ and $\underline{t}$ **[4 marks]**

c) Determine the angle between the two vectors $\underline{a} = 4\hat{i} + 3\hat{j}$ and $\underline{b} = 8\hat{i} - 6\hat{j}$ **[6 marks]**

d) If $\vec{a} = 2\hat{i} - 3\hat{j}$; $\vec{b} = 4\hat{i} - 2\hat{j}$; Find $\left|2\vec{a} - 3\vec{b}\right|$ **[4 marks]**