

UNIVERSITY EXAMINATIONS

**EXAMINATION FOR THE AWARD OF CERTIFICATE FOR BRIDGING
COURSE IN MATHEMATICS**

MATH OO10: GEOMETRY AND VECTORS

STREAM: CBM

TIME: 2 HOURS

DAY/DATE: MONDAY 12/4/2010

11.30A.M. – 1.30P.M.

INSTRUCTIONS:

- Answer all Questions in Section A and any three questions in Section B.
- All working must be clearly and neatly shown.
- Adhere to all the instructions on your answer booklet.

SECTION A (30 MARKS)

1. The length of a room is 4 metres longer than its width. Find the length of the room if its Area is 32m^2 . [3 marks]
2. Given that $\sin(x + 30^\circ) = \cos 2x$ for $0^\circ \leq x \leq 90^\circ$, Find the value of x . Hence find the value of $\cos^2 3x^\circ$. [3 marks]
3. The Position Vectors of P and Q are $4j + 3j + 2k$ and $3i - 6j + 6k$ respectively. Express vector PQ in terms of unit vector i, j and k and find $|PQ|$. [3 marks]
4. A point R divides a line PQ internally in the ratio 3:4. Another point S divides the line PR externally in the ratio 5:2. Given that $PQ = 8\text{cm}$, Calculate the length of RS correct to 2 decimal places. [3 marks]
5. An open cylindrical object has radius 42cm and length 150cm. Calculate its total surface area and its volume. [3 marks]

6. Point T is the midpoint of a straight line AB. Given that the position vectors of A and T are $i - j + k$ and $2i + \frac{3}{2}k$ respectively, find the position vector of B in terms of i, j , and k . [3 marks]
7. Find the angle subtended at the centre of a circle by an arc of 11 cm if the diameter of the circle is 21cm (take $\pi = \frac{22}{7}$). [3 marks]
8. Determine the angle between the vectors $\tilde{a} = i + 2j + 2k$ and $\tilde{b} = 2i + 3j + 6k$. [3 marks]
9. Find the equation of a line segment joining the points A(2,3) and B(4,7) and its normal equation at (1,1). [3 marks]
10. Calculate the volume of a cone whose diameter is 14cm and height 24cm. [3 marks]

SECTION B (30 MARKS)

Answer any three Questions in this section.

11. (a) Solve for x° in the equation
- $$6\sin(2x - 10)^\circ + 3 = 0. \quad [3 \text{ marks}]$$
- (b) Find the equation of a perpendicular bisector of the line segment joining the points A (3,5) and B(-3 7). [3 marks]
- (c) State the co-ordinates of the four major points on the circumference of a circle given by $x^2 + y^2 + x + 6y - 12 = 0$. [4 marks]
12. (a) Solve the equation
- $$4\sin^2\theta + 4\cos\theta = 5$$
- for $0 \leq \theta \leq 360^\circ$. [3 marks]

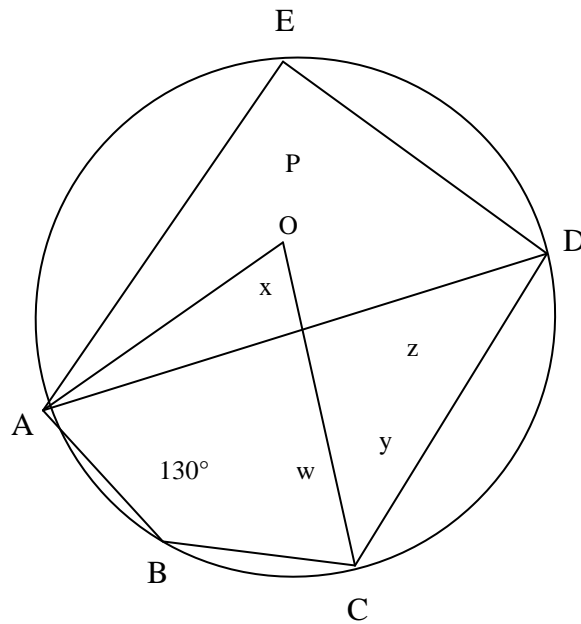
- (b) In a triangle ABC $\angle A = 120^\circ$ BC = 20cm and AC = 8cm, find the value of angle B and Area of triangle ABC. [3 marks]
- (c) XY and PZ are parallel chords of a circle 2cm apart. If PZ = 10cm and XY = 8cm, Find the radius of the circle. [4 marks]
13. (a) From the top of a cliff 30m high the angle of depression of a boat is 60° . How far away is the boat from the foot of the cliff? [3 marks]
- (b) Given $\tan \theta = \frac{3}{8}$ state $\cos \theta$ and $\sin \theta$ without using tables. [3 marks]
- (c) A has co-ordinates (3,4) B has co-ordinates (x,5). If $|AB| = 5\sqrt{2}$, Find the possible values of x. [4 marks]
14. (a) An Electric pylon is 30m high. A point S on top of the pylon is vertically above another point R on the ground. Points A and B are on the same horizontal ground as R. Point A is due south of the pylon and the angle of elevation of S from A is 26° . Point B is due west of the pylon and angle of elevation of S from B is 32° .
- Calculate
- (i) distance from A to B
- (ii) Bearing of B from A [7 marks]
- (b) Given that vector $a = \begin{pmatrix} 2 \\ -6 \end{pmatrix}$, $b = \begin{pmatrix} -4 \\ 5 \end{pmatrix}$ and $c = \begin{pmatrix} -6 \\ 3 \end{pmatrix}$
- Find $|a + 2b - 3c|$ [3 marks]

15. (a) Prove that the following points are collinear

A (1 2) B (3 5) C (7 11).

[2 marks]

- (b) State the value of angles indicated in the figure below; Given that $\angle ABC = 130^\circ$ and O is the centre of the circle and $\overline{AB} = \overline{BC}$.



[8 marks]

