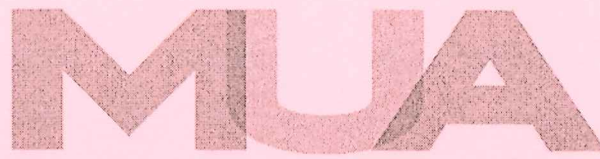


The
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UNDERGRADUATE UNIVERSITY EXAMINATIONS

SCHOOL OF MANAGEMENT AND LEADERSHIP

DEGREE OF BACHELOR OF EDUCATION ARTS

MTH 225: ANALYTICAL GEOMETRY

DATE: 26TH JULY 2022

DURATION: 2 HOURS

MAXIMUM MARKS: 70

INSTRUCTIONS:

1. Write your registration number on the answer booklet.
2. **DO NOT** write on this question paper.
3. This paper contains **SIX (6)** questions.
4. Question **ONE** is compulsory.
5. Answer any other **THREE** questions.
6. Question **ONE** carries **25 MARKS** and the rest carry **15 MARKS** each.
7. Write all your answers in the Examination answer booklet provided.

QUESTION ONE

- a) Giving reasons, determine whether the given pair of lines are parallel or perpendicular. $2x + 3y = 6$ and $3x - 2y = 6$ (2 marks)
- b) A line $y - 3x = 5$ is perpendicular to line AB. If the two lines intersect at $y - axis$
- Find the equation on line AB (3 marks)
 - Compute the $x - intercept$ of line AB (2 marks)
- c) Compute the acute angle formed by the line $2y - 3x = 6$ and the $x - axis$ (3 marks)
- d) A line is 5 units long. If it starts from point $P(3, 5)$ and ends at $Q(7, k)$, evaluate the two possible values of k (3 marks)
- e) Establish the centre and radius of the circle $4x^2 - 8y + 4y^2 - 12y - 3 = 0$ (5 marks)
- f) The pole of a fence is 2m tall. The angle of elevation from the top of the fence pole to the top of an electric pole is 30° , and the angle of depression from the top of the fence pole to the bottom of the electric pole is 60° . Assuming the ground is horizontal and the two poles are vertical, compute;
- The distance between the two poles (4 marks)
 - The height of the electric pole (3 marks)

QUESTION TWO

A triangle with the vertices $A(-1, 7)$, $B(8, 4)$ and $C(7, 1)$.

- Show that $\angle ABC = 90^\circ$ (4 marks)
- Determine the area of the triangle (4 marks)
- Determine the equation of the circle passing through point A, B and C. (7 marks)

QUESTION THREE

The point $M(2, 1)$ is the midpoint of a chord PQ of a circle

$$x^2 + y^2 - x - 2y - 5 = 0$$

- a) Determine the coordinates of the centre A of the circle (2 marks)
- b) Determine the radius of the circle (2 marks)
- c) If the chord PQ is perpendicular to AM determine the equation of the chord PQ. (4 marks)
- d) Calculate the coordinates of points P and Q (5 marks)
- e) Compute the magnitude of chord PQ (2 marks)

QUESTION FOUR

- a) The sum of interior angles of a polygon is 24 times the exterior angle. Compute the number of sides the polygon has. (5 marks)
- b) A circle with its centre at the origin passes through the point $P(2\sqrt{3}, 2)$
- i. Determine the equation of the circle (3 marks)
 - ii. Determine the gradient of the line OP (2 marks)
 - iii. Determine the angle between the line OP and the positive side of the $x - axis$ (2 marks)
 - iv. Determine the equation of the tangent to the circle at $P(2\sqrt{3}, 2)$ in the form $y = ax + q$ (3 marks)

QUESTION FIVE

- a) An exterior angle of a regular polygon is 24. Compute the sum of the polygon's interior angles. (3 marks)
- b) The vertices A and B of triangle ABC lie on the $x - axis$. An inscribed circle has its centre at $Q(4, 5)$. The circle touches line AC at $D(0, 8)$ and BC at $E(8, 8)$. Determine
- i. The equation of the circle (2 marks)
 - ii. The equation of BC (3 marks)

- iii. The gradient of AC (2 marks)
- iv. Giving reasons, prove that $AC = BC$ (5 marks)

QUESTION SIX

A circle with its centre at the origin passes through a point $T(-2\sqrt{3}, -2)$ and cuts both the x - axis and y - axis on their negative sides at points P and S respectively.

- i. Compute the coordinates for P and S (4 marks)
- ii. Determine the equation of line PS (3 marks)
- iii. QN is a line perpendicular to line PS and passing through the origin. Write down its equation. (2 marks)
- iv. Calculate the coordinates of N if QN meets line PS at N (4 marks)
- v. Find the coordinates of point E which is a reflection of point T on line $y = -x$ (2 marks)