



UNIVERSITY EXAMINATIONS
FIRST YEAR EXAMINATION FOR THE AWARD OF THE
DIPLOMA IN FISHERIES AND AQUACULTURE
SECOND SEMESTER 2023/2024
[JAN – APRIL, 2024]

MATH 0101: GEOMETRY AND ELEMENTARY APPLIED MATHEMATICS

STREAM: Y1 S2

TIME: 2 HOURS

DAY: MODAY, 12:00 - 2:00 P.M

DATE: 15/04/2024

INSTRUCTIONS

- 1. Do not write anything on this question paper.**
- 2. Answer question ONE (Compulsory) and any other TWO questions.**

QUESTION ONE (30 MARKS)

1. Define the following terms
 - i. Relative motion (2 marks)
 - ii. Friction (2 marks)
 - iii. Moments (2 marks)
 - iv. Couples (2 marks)
2. The line joining the points (4,0) and (3,2) meet the y axis at point (0,B) find the value B. (4 marks)
3. outline three types of friction (3 marks)
4. The vector $PQ = \begin{pmatrix} -3 \\ 2 \end{pmatrix}$. Given that the point P is (1,4), find the coordinates of Q. (3 marks)
5. given that A(2,3) and B(4,-1) find \overline{AB} (3 marks)
6. find the general form of the equation of the plane passing through (1,3,6) and perpendicular to $n = -3i + 2j + k$ (4 marks)
7. find the parametric and symmetric equations of the line that passes through (1,-2,4) and parallel to $v = \langle 2, 4, -4 \rangle$ (5 marks)

QUESTION TWO (20 MARKS)

1. State the first, second and third newton's Laws of Motion (3 marks)

2. Find the angle between the vectors

$$\vec{a} = 2\hat{i} - \hat{j} + 3\hat{k}$$

$$\vec{b} = -3\hat{i} + 4\hat{j} - \hat{k}$$

(5 marks)

3. Find the angles between the lines.

i. $y = 3x + 7$ and

$$3y = x + 8$$

(3 marks)

ii. $x - 2y = 1$

$$-3x + y + 12$$

(3 marks)

4. State three laws of friction. (3 marks)

5. find the cartesian equation of the polar equation $r \cos(\theta - \alpha) = p$

(3 marks)

QUESTION THREE (20 MARKS)

1. State and prove the rolle's theorem with an example (7 marks)

2. find the cartesian equation of

a. $r = a(1 + 2\cos \theta)$

(4marks)

b. Find the polar equation whose cartesian equation is $x^2 + y^2 = 4x$

(4 marks)

3. Given that $3x - 4y - 12 = 0$ find;

i. The gradient. (2 marks)

ii. The intercepts of the line. Hence sketch the line. (3 marks)

QUESTION FOUR (20 MARKS)

1. Find the equation of the line passing through A(1,2), B(3,5) (4 marks)

2. Find the equation of the line whose gradient is $\frac{4}{3}$ and passing through the point (6,2) (3 marks)

3. What is the relationship between polar and cartesian coordinates. (4 marks)

4. Find the unit vector parallel to the resultant of vectors

$$\vec{a} = 3\hat{i} + 4\hat{j} - 8\hat{k}$$

$$\vec{b} = 6\hat{j} + 4\hat{k}$$

(5 marks)

5. How much does a 5kg mag weighs (3 marks)

6. Define the term acceleration (1 mark)

QUESTION FIVE (20 MARKS)

1. Express (4,-4) in polar coordinates (2 marks)
2. Derive the equation of motion $v^2 = u^2 + 2a$ (3 marks)
3. The motion of an object is governed by the equation $s = 60t - 2t^2$, where t is the time in seconds and s is the height of the object above the ground in meters. (take $g = 9.8 \text{ m/s}^2$)
 - i. Determine its velocity after 2 seconds (2 marks)
 - ii. What is the maximum height reached by the object (3 marks)
4. Find the cartesian equation for the plane that contains the point (-1,3,6) and perpendicular to the vector $\begin{pmatrix} 2 \\ 4 \\ -1 \end{pmatrix}$ (3 marks)
5. What are the applications of friction (2 marks)
6. Derive the first and second equation of motion (5 marks)