الجامعة الوطنية
National University
Science & Technology للعلوم والتكنولوجيا
كلية عمان البحرية الدولية
International Maritime College Oman

ACADEMIC YEAR 2023 - 2024

Program	Year	Semester	Paper
MEO	1	2	MAIN

MODULE NAME:	**Math 2**		
MODULE CODE:	**MMATH-II**	**EXAM DATE:**	**22.05.2024**
INSTRUCTOR's NAME:	**Muhammad Kazam Razaq**	**DURATION:**	**2 hrs.**

Questions to be answered on:	**Allowed tools:**	**Number of pages**
✓ Space provided on the question paper	Pen, Calculator & Pencil (only for drawing)	(Incl. cover page)**: 14**

Points of attention:

- For each question, the maximum earned points are mentioned between brackets at the end of each question.
- Write very clearly! Answers that are not readable are not marked and don't get points!
- Make sure your answers are written to the point.
- All answers should be written **in English.**
- Write all the answers in **blue or black pen only.**
- Use the **pencil** only for **diagrams & graphs.**
- Show all the calculation steps in the given space.
- When finished submit the question paper, together with the answer scripts and the signed cover page to the invigilator.
- Any cheating/copying may result in an instant failing of the examination.

FINAL MARKS

STUDENT NAME:	
STUDENT ID:	

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Number of answer scripts:……..…….

Invigilator:……..……..…..

Student's signature: ……

Time of receipt:……..…..

ANSWER ALL THE QUESTIONS

Show all the calculation steps in the given space.

1. **[10 Marks]**

a. Find the angle between **u** and **v**, rounded to the nearest degree. **(3 marks)**

$\boldsymbol{u} = \boldsymbol{i} + 2\boldsymbol{j} - 2\boldsymbol{k}, \quad \boldsymbol{v} = 4\boldsymbol{i} - 3\boldsymbol{k}$

b. Calculate the direction angles of the vector given below. **(3 marks)**

$3\boldsymbol{i} + 4\boldsymbol{j} + 5\boldsymbol{k}$

c. Calculate the area of ΔPQR with vertices given below. **(4 marks)**

$P(3,-2,6)$, $Q(-1,-4,-6)$, $R(-3,4,2)$

2. Evaluate the limits given below. **[10 Marks]**

a. $\lim_{h\to 0} \frac{\sqrt{9+h}-3}{h}$ **(4 marks)**

b. $\lim_{x\to 0} \frac{\sin 3x}{\sin 2x}$ **(3 marks)**

c. $\lim_{x\to \infty} (\frac{x-1}{x+1} + 6)$ **(3 marks)**

3. **[10 marks]**

a. Simplify the expression given below and write the result in the form $a + bj$. **(3 marks)**

$$\frac{5-j}{3+4j}$$

b. In an alternating-current circuit, the voltage E is given by $E = IZ$ where I is the current (in A) and Z is the impedance (in Ω). If $I = (0.835 - 0.427j)A$ and $Z = (250 + 170j)\Omega$, calculate the complex number representation for E. **(2 marks)**

c. Use DeMoivre's theorem to find all the cube roots of $3 - 4j$. **(5 marks)**

4. **[10 marks]**

a. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & -1 \\ 3 & 2 \end{bmatrix}$, prove that $(AB)^{-1} = B^{-1}A^{-1}$ **(4 marks)**

b. Three machines together produce 650 parts each hour. Twice the production of the second machine is 10 $parts/h$ more than the sum of the production of the other two machines. If the first operates for 3 h and the others operate for 2 h, 1550 parts are produced. Write down the system of equations for the production rate of machines and use **Cramer's rule** or **Gauss elimination** method to determine the production rate of each machine. **(6 marks)**

MLO & Bloom's Level of Complexity

Q #	MLO Addressed	Complexity Level	Mark	Remark
1	**2**	Application	**10**	**Expect 100% to solve**
2	**1**	Understanding	**10**	**Expect 80% to solve**
3	**1**	Understanding	**10**	**Expect 70% to solve**
4	**4**	Evaluating	**10**	**Expect 100% to solve**