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

ACADEMIC YEAR 2023 – 2024

Program	Year	Semester	Paper
DO/ME	1	1	MAIN

MODULE NAME:	MATHEMATICS - I

MODULE CODE:	D/MMATH- I	EXAM DATE:	25.12.2023
TEACHER'S NAME:	Dr. Yaqoob Mubarak Al Rahbi	DURATION:	120 MINS.

Questions to be answered on:	Allowed requirements	Number of pages
Space provided on the question paper	Pen, Pencil, Calculator	(Incl. Cover Page): 11

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 (No pencil)**.
- Answer written in **Pencil** will not be marked.
- Use the **pencil** only for **diagrams & graphs & drawing**.
- 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:			40
STUDENT ID:			10

Number of answer scripts: …… **Invigilator:** …….....

Student's signature: …… **Time of receipt:** …….....

1) Find the probabilities for each, using the standard normal distribution: **[4 Marks]**
   a. $P(z > 0.82)$.
   b. $P(1.56 < z < 2.13)$.

2) Express $\cos 2t - 2\sin 2t$ in the form $A\sin(\omega t + \alpha)$, then state the following: **[6 Marks]**

a. The maximum value of the wave function.
b. The period.
c. The frequency.

3) A ship travels 17 km on a bearing of 120°. It then travels 24 km on a bearing of 275°. **[6 Marks]**

   a. Find the distance of the ship from its starting position.
   b. Find the bearing of the ship must take so that it can travel in a straight line back to its position.

4) The frequency distribution shows the salaries (in millions) for a specific year of the top 25 CEOs in the United States. Find the *mean*. **[6 Marks]**

Class boundaries	Frequency
15.5-20.5	13
20.5-25.5	6
25.5-30.5	4
30.5-35.5	1
35.5-40.5	2

5) Find the *estimated mode* for the following frequency distribution: **[6 Marks]**

Class boundaries	Frequency
47.5–54.5	3
54.5–61.5	2
61.5–68.5	9
68.5–75.5	13
75.5–82.5	8
82.5–89.5	3
89.5–96.5	2

6) For a certain group of individuals, the average heart rate is 72 beats per minute. Assume the variable is normally distributed and the standard deviation is 3 beats per minute. If a subject is selected at random, find the probability that the person has the following heart rate. **[6 Marks]**

   a. Between 68 and 74 beats per minute.
   b. Less than 75 beats per minute.

7) In spherical triangle ABC. Angle $C = 90°$, angle $B = 30°$ and side $AB = 70°$. **[6 Marks]**

a. Find AC.

b. Find angle A.

ROUGH WORK

Formulas sheet:

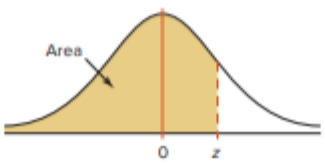
No	Formula
1)	Law of cosines: $a^2 = b^2 + c^2 - 2bc\ cosA$ $b^2 = a^2 + c^2 - 2ac\ cosB$ $c^2 = a^2 + b^2 - 2ab\ cosC$
2)	$\sin^2 x + \cos^2 x = 1$
3)	$\sin(A+B) = \sin A \cos B + \sin B \cos A$ $\sin(A-B) = \sin A \cos B - \sin B \cos A$ $\cos(A+B) = \cos A \cos B - \sin A \sin B$ $\cos(A-B) = \cos A \cos B + \sin A \sin B$
4)	Law of sines: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
5)	$\bar{x} = \frac{\sum_{i=1}^{N} x_i}{N}$
6)	$\bar{x} = \frac{\sum_{i=1}^{N} x_i f_i}{\sum_{i=1}^{N} f_i}$
7)	Sine middle part = Product of cosines of opposite parts.
8)	Sine middle parts = Products of tangents of adjacent part.
9)	$\text{Hav.}\,\theta = \frac{1-\cos\theta}{2}$
10)	$\text{Hav. angle} = \frac{\text{Hav.side opposite} - \text{Hav.(diff sides adjct)}}{\text{product of sines of adjacent sides}}$
11)	$\sigma = \sqrt{\frac{\sum_{i=1}^{N}(x_i - \bar{x})}{N}}$
12)	$\sigma = \sqrt{\frac{\sum_{i=1}^{N}(x_i - \bar{x})^2 f_i}{\sum_{i=1}^{N} f_i}}$
13)	$z = \frac{x-u}{\sigma}$
14)	$u = n.p$ and $\sigma = \sqrt{n.p.q}$
15)	**Binomial** / **Normal** When finding: / Use: 1. $P(X = a)$ / $P(a - 0.5 < X < a + 0.5)$ 2. $P(X \geq a)$ / $P(X > a - 0.5)$ 3. $P(X > a)$ / $P(X > a + 0.5)$ 4. $P(X \leq a)$ / $P(X < a + 0.5)$ 5. $P(X < a)$ / $P(X < a - 0.5)$
16)	$E_{\text{Median}} = L + \left(\frac{\frac{n}{2} - B}{G}\right) W$
17)	$E_{\text{Mode}} = L + \frac{(f_m - f_{m-1})}{(f_m - f_{m-1}) + (f_m - f_{m+1})} W$

TABLE E *(continued)*

Cumulative Standard Normal Distribution

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

For z values greater than 3.49, use 0.9999.



[END OF THE EXAM]