Sample paper
Mathematics 1

Answer any five questions including question number one.

Question 01

a. Fill in the blanks with ϵ, ϵ, ⊆, = or ≠. Recall that Z is the set of all integers and ϕ is the empty set.

i. Ø ---------- {1, 3, 7}

ii. -5 ---------- Z+

iii. {1,3,7} ---------- Z

iv. 51 ---------- {204, 187, 170, …}

v. 20 ---------- {4, 8, 12}

b. Answer the following questions using the information given.

Ω = {2,4,6,8,10,12,14} A = {2} B = {6,12}, C = {10,12,14}

i. Subsets of A
ii. Define set A
iii. A ∩ C
iv. A ∪ B
v. C – B
vi. A'
vii. A ∪C'
viii. (A∩ B)'

c. There are 59 students in a school and they are asked to join with clubs and societies at school. Each student can join up for a minimum of one and a maximum of three clubs. The three clubs to choose from are the drama club, the dancing club, and the gavel club. A total of 22 students sign up for the drama club, 27 students for the dancing club, and 28 students for the gavel club. If 6 students sign up for exactly two clubs, how many students sign up for all three clubs?

Question 02

a. Verify the type of the following propositional logics

i. $(p \rightarrow q) \vee (q \rightarrow p)$

ii. $((p \vee \sim q) \wedge r) \leftrightarrow (\sim(p \wedge r) \vee q)$

iii. $\sim p \rightarrow q \vee r$

b. Draw truth tables for $p \rightarrow (q \wedge \neg q)$ and $\neg p$. Are they logically equivalent?

Question 03

Mr. A inherited Rs. 25,000 and invested part of it in a savings account, part in municipal bonds, and part in a fixed deposit. After one year, he received a total of Rs. 1,620 in simple interest from the three investments. The savings account paid 6% annually, the bonds paid 7% annually, and the fixed deposit paid 8% annually. There was Rs. 6,000 more invested in the bonds than the fixed deposit.

i. Formulate three simultaneous equations.

ii. Find the amount Mr. A invested in each category by solving the system of equations using matrices.

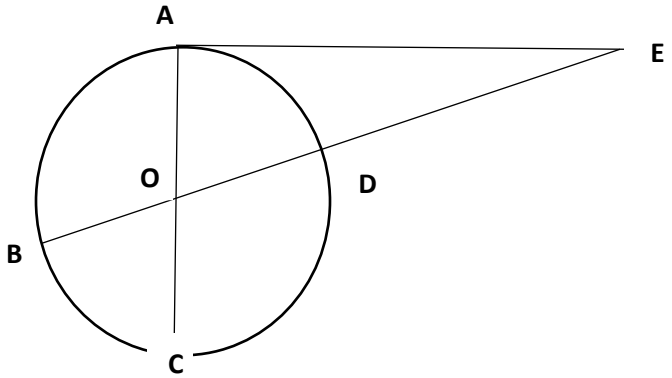
iii. If $A = \begin{bmatrix} 2 & -1 \\ 3 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ Find AB and the find the inverse matrix of it.

Question 04

a. Find all points of intersections of the circle $x^2 + 2x + y^2 + 4y = -1$ and the line $x - y = 1$

b. Find the area of the triangle enclosed by the x - axis and the lines $y = x$ and $y = -2x + 3$.

c. In the figure below points A, B, C and D are on a circle. AE is a tangent to the circle. O is the intersection point of AC and BD. Coordinates of A and D are (2,4) and (2.5,8) respectively. If AO:OC=1:3 and O(3,5), Find the equation of the circle and the line equation of the tangent AE.



Question 05

a. Evaluate the following:

I. $\log_7 5$

II. $\log_5 0.008 \ \log_8 0.125$

III. Solve the following equation $2\log_3(x+10) - \log_3 2x = 2$
(4 marks)

IV. Solve the equation $4^{2x} - 12(4^x) + 36 = 0$. Find the value of x for three decimal places.

b. Show that $\log_b x = \frac{1}{\log_x b}$

Question 06

a.

i. What is the difference between a census and a sample survey?

ii. What is meant by a statistic?

iii. What is the difference between a population and a survey?

iv. Explain quantitative variables using an example.

v. Explain qualitative variables using an example.

b. Following frequency distribution tables shows the distribution of the Z-Score of G.C.E (A/L) examination of 100 students.

Class Interval (z-Score)	**Number of Students**
0 - 0.5	40
0.5 - 1.0	30
1.0 - 1.5	10
1.5 - 2.0	15
2.0 – 2.5	5

i. Draw the histogram using the frequency distribution table.

ii. Find the mean value of the distribution.

iii. Find the mode value of the distribution.

iv. Find the variance.

v. Find the standard deviation.