

The Open University of Sri Lanka
 Department of Mathematics
 Advanced Certificate in Laboratory Technology Programme
 Final Examination 2022/23



Mathematics for Laboratory Technology-ADC2206

Duration: Two Hours

Date: 23 - 10 - 2022

Time: 09.30 a.m. - 11.30 a.m.

Answer Four questions Only

Two questions from each part should be answered

PART - A

Q1) a) Simplify the following expressions as far as possible

$$\text{i) } \frac{y^4 - 4y^2}{x^2 - 1} \times \frac{x^3 - x}{y^3 - 2y^2} \quad \text{ii) } \frac{5^{1/2} \times 5^0 \times (25)^{1/2}}{(125)^{1/3}}$$

b) i) Prove that $\log_a b = \frac{1}{\log_b a}$

Hence show that $\frac{1}{\log_a(abc)} + \frac{1}{\log_b(abc)} + \frac{1}{\log_c(abc)} = 1$

ii) Evaluate $3 \log_3(6) + 5 \log_3(2) - 3 \log_3(2) - \log_3(96)$

c) i) Express $\frac{3-2i}{2+3i}$ in the form of $x + yi$

ii) Find the values of x and y that satisfy $(1 + 4i)(x + yi) = 9 + 2i$

Q2) a) i) Expand $(x + 2)^4$ using binomial theorem.

ii) Find the coefficient of x^3 term of the expression $(1 + 2x)^5$

b) Sketch the graph of the function $y = -x^2 + 4x + 8$ and find

i) coordinates of vertex **ii)** axis of symmetry

c) Find the value of x of the following equation

$$9^x - 4(3^x) + 3 = 0 \quad (\text{Hint: Let } X=3^x)$$

d) If the roots of $x^2 + 5x + 3 = 0$ are α and β

i) Find the value of $\frac{1}{\alpha^2} + \frac{1}{\beta^2}$

ii) Find the value of $\frac{1}{(\alpha\beta)^2}$

iii) Hence find the quadratic equation that has the roots $\frac{1}{\alpha^2}$ and $\frac{1}{\beta^2}$

Q3) a) Nimal has six balls with different colours.

i) If these six balls are placed in a row considering the order of the colour, how many different ways can be arranged.

ii) If 4 balls from 6 balls are taken at a time and placed in a row without considering the order of the colour, how many different ways can be arranged.

b) Two matrices A and B are given as follows.

$$A = \begin{pmatrix} 3 & 2 & 3 \\ 6 & 3 & 2 \\ 5 & 1 & 1 \end{pmatrix} \quad B = \begin{pmatrix} 2 & 1 \\ 4 & 1 \\ 1 & -1 \end{pmatrix}$$

i) Find AB

ii) Find A^T

c) Evaluate the following expressions

i) $\lim_{x \rightarrow 0} \left(\frac{1+x}{1+x^3} \right)$

ii) $\lim_{x \rightarrow 2} \frac{4x^2 - 16}{(x-2)(x+1)}$

iii) $\lim_{x \rightarrow 1} \frac{x^3 - 1}{(x^2 - 1)(x^2 + 1)}$

PART - B

Q4) 50 smokers were asked to record their consumption of cigarettes each day for several weeks. The table shown is based on the information obtained.

Average consumption of cigarettes	0 - 8	8 - 16	16 - 24	24 - 32	32 - 40	40 - 48
No. of smokers(f)	04	06	12	18	06	04

- Draw
- i) Histogram for the above distribution
 - ii) Frequency polygon for the above distribution
 - iii) Cumulative frequency curve for the above distribution
- and
- iv) With the use of the above curve, determine the Median cigarette consumption.

Q5) The distribution of age in a certain village of 150 people is as follows

Age(years)	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70
No. of people(f)	16	20	24	30	26	22	12

- Find
- i) Mean of the distribution
 - ii) Median of the distribution
 - iii) Mode of the distribution
 - iv) Standard deviation of the distribution

Q6) a) In a particular firm, a virus spread among employees of different ages in the manner described below.

Age	18 - 24	24 - 30	30 - 36	36 - 42	42 - 48	48 - 54	54 - 60
No. of employees	18	22	42	50	28	26	14

- Find
- i) First Quartile(Q1)
 - ii) Third Quartile(Q3)
 - iii) Interquartile Range
 - iv) Quartile deviation

b) A Coin and a Die are tossed. Let A be the event 'The Coin lands Head with a number greater than 2 on the Die' and let B be the event 'The Coin lands Head with an even number on the Die'.

- i) List the Universal Set(\mathcal{E})
- ii) List the event A
- iii) List the event B
- iv) List $(A \cap B)'$
- v) List $(A \cup B)'$
- vi) List $(A' \cap B)$

***** All Rights Reserved*****