

Semester End Examination
Paro College of Education
Royal University of Bhutan
Paro

Module: MAT 101, (Elementary Algebra)

Programme: B. Ed Sec

Level: 1

Writing Time: 3 hours

Full mark: 100

DIRECTION: *This question paper consists of two sections, A and B. Section A consists of selected-response type questions and section B consists of constructed-response type questions. The weighting for Section A is 20 marks and section B is 80 marks. Every question in section A is worth 2 marks and section B 16 marks. The intended marks for the questions in section B are given alongside every question. Instructions for each section are mentioned accordingly. You are **NOT** allowed to carry/use any electronic devices to answer the questions other than a calculator.*

SECTION – A ($10 \times 2 = 20$ marks)

INSTRUCTION: *Answer all the sub-questions numbered a to j. Choose only one answer for each sub-question and write in the answer script against the question number.*

Question 1

a. The value of x in the quadratic equation $x^2 + 6x + 9$ is:

- A. -3
- B. -2
- C. 3
- D. 2

b. The value of x and y in the system of linear equations

$x + 2y = \frac{5}{6}$ and $2x - y = \frac{1}{3}$ is:

- A. $x = 2, y = 3$
- B. $x = -2, y = -3$
- C. $x = \frac{1}{2}, y = \frac{2}{3}$
- D. $x = -\frac{1}{2}, y = -\frac{2}{3}$

c. Determine the solution to the following linear system:

$$y = -2x + 5 \quad 4x + 2y - 15 = 0$$

- A. (5, -5)
- B. (5, -2.5)
- C. There is no solution.
- D. There are infinite solutions.

d. What is the remainder when $2x^2 - 3x + 5$ is divided by $2x - 1$?

- A. 2
- B. 3
- C. 4
- D. 5

e. Which of the following is a factor of $2x^3 - x^2 - 21x + 18$?

- A. $x - 1$
- B. $x - 2$
- C. $x - 3$
- D. $x - 4$

f. What is the thirty-second term of the arithmetic sequence -12, -7, -2, 3, ... ?

- A. 143
- B. 148
- C. 153
- D. 167

g. What is the sum of the first sixteen terms of the arithmetic sequence 1, 5, 9, 13, ... ?

- A. 62
- B. 496
- C. 528
- D. 992

h. There are six terms in the geometric series $2 + 6 + 18 + 54 + \dots$

The sum of the geometric series is:

- A. 728
- B. 364
- C. 1456
- D. 182

i. $A = \{1, 2, 3, 4\}$, $B = \{a, b, c\}$. The subset of $A \times B$, that is, $\{(1,a), (1,b), (1,c)\}$ is:

- A. transitive and symmetric
- B. transitive and reflexive
- C. symmetric and reflexive
- D. transitive

j. $A \times (B \cap C)$ is equal to:

- A. $(A \times B) \cap (B \times C)$
- B. $(A \times B) \cap (A \times C)$
- C. $(A \times B) \cup (B \times C)$
- D. $(A \times B) \cap (B \times C)$

SECTION B ($16 \times 5 = 80$ marks)

INSTRUCTION: *There are SIX questions in this section. Answer any FIVE questions. Sub-questions must be answered in order and completely for every question attempted.*

Question 2

- (a) Find the values of x, y and z from the system of linear equations.

$$x + y + z = -5; \quad 2x + z = -2; \quad y + 2z = -10 \quad [8]$$

- (b). In the same coordinate plane, sketch the graph of each function.

i. $f(x) = 2^x$ ii. $g(x) = \log_2 x$ [8]

Question 3

- (a) Solve the following quadratic function: $y = 2x^2 - 12x - 32$

i. graphically ii. Using vertex and line of symmetry [8]

- (b) Express $\frac{2x-1}{x^2+7x+12}$ in partial fractions. [8]

Question 4

- (a) Identify the vertex, axis of symmetry and opening of each parabola.

i) $y = x^2 + 4x - 5$ ii) $y = 2(x + 10)^2 + 1$

iii) $y = -\frac{1}{3}x^2 + \frac{16}{3}x - \frac{46}{3}$ [10]

- (b) Graph the equations i, ii and iii by factoring, ii. Intercept. [6]

Question 5

- (a) Solve the system of linear equations $x + y = -1, 2x + 3y = -5$ by:

i) graphing ii) elimination method. [8]

- (b) Express $\frac{7x-23}{x^2-7x+12}$ in partial fractions. [8]

Question 6

- (a) Give examples of relations on $A = \{1, 2, 3, 4, 5\}$ having the following properties:
i. Reflexive, symmetric and not transitive ii) Not reflexive, symmetric and transitive.

[8]

- (b) Suppose $A = \{-2, -1, 0, 1, 2\}, B = \{-3, -2, -1, 0, 1\}$.

i. List: a) $A \times B$ b) $B \times A$

ii. Graph: a) $A \times B$ b) $B \times A$

[8]

Question 7

- (a) Find the factor of $6x^3 + 5x^2 - 2x - 1$?

[8]

- (b) The fifth term of an arithmetic sequence is 11 and the tenth term is 41.
What is the first term?

[4]

- (c) The first term of an arithmetic sequence is 4 and the tenth term is 67.
What is the common difference?

[4]