
UNIVERSITY OF ESWATINI



MAIN EXAMINATION, 2019/2020

BASS

Title of Paper : Elementary Quantitative Techniques I

Course Number : MAT101

Time Allowed : Three (3) Hours

Instructions

1. This paper consists of SEVEN (7) questions in TWO sections.
 - (a) Section A is **COMPULSORY** and is worth 40%. Answer **ALL** questions in this section.
 - (b) Section B consists of FIVE questions, each worth 20%. Answer **ANY THREE** (3) questions in this section.
2. Show all your working.
3. Start each new major question (A1, A2, B2, ..., B7) on a new page and clearly indicate the question number at the top of the page.
4. Non-programmable calculators may be used (unless otherwise stated).

Special Requirements: NONE

THIS EXAMINATION PAPER SHOULD NOT BE OPENED UNTIL PERMISSION HAS BEEN GIVEN BY THE INVIGILATOR.

SECTION A

ANSWER ALL QUESTIONS

QUESTION A1

(a) Factorise

(i) $3x^2 - 7x - 6$

(ii) $y^2 - 14y + 24$ (4 marks)

(b) Use the quadratic formula to solve

$6x^2 + x - 12 = 0$ (4 marks)

(c) Find the 10th term

$\left(x + \frac{3}{x}\right)^{12}$ (6 marks)

(d) Solve the simultaneous equations

$3x - y = 13$ (6 marks)

$2x + 7y = 1$

QUESTION A2

(a) Expand and simplify

$(x - 2y)^5$ (6 marks)

(b) The 4th term of an A.P. is 14 and the 8th term is 30. Find the first term and the common difference. (6 marks)

(c) When $x^4 + kx^2 + 18x - 5$ is divided by $x - 2$ the remainder is -5 . Find the value of k . (4 marks)

(d) Use Cramer's rule to solve

$4x + 3y = -5$ (4 marks)

$5x - 7y = -17$

SECTION B

ANSWER ANY THREE QUESTIONS

QUESTION B3

- (a) Find the values of a and b for which the polynomial $x^3 + ax^2 + bx - 4$ is exactly divisible by $x - 1$ and $x + 2$ (10 marks)
- (b) Use both the remainder theorem and synthetic division to find all the real roots of the equation $x^4 + x^3 - 7x^2 - x + 6 = 0$. (10 marks)

QUESTION B4

- (a) Find
- i. the constant term, and
 - ii. the term involving x^6 ,
- in the binomial expansion of $\left(x + \frac{1}{x}\right)^8$. (10 marks)
- (b) Find the equation of the line which is parallel to the line $3x - 2y - 4 = 0$ and which passes through the point $(0,2)$. (5 marks)
- (c) Write down the equation of the line which perpendicular to the line $3x - 4y = 2$ and which passes through the point $(-1,1)$. (5 marks)

QUESTION B5

- (a) Find the 10th term in $\left(x - \frac{1}{x}\right)^{20}$ (5 marks)
- (b) Use the quadratic formula to solve $2x^2 + x - 6 = 0$ (5 marks)
- (c) A parent sets up a fund for a child by making monthly deposits. He deposits E350, E400, E450 at the end of the 1st, 2nd and 3rd months, respectively. Find
- (i) the instalment after 2 years (3 marks)
 - (ii) when the instalment will reach E109,500.00 (3 marks)
 - (iii) total deposits after 3 years. (4 marks)

QUESTION B6

(a) Use the long division to work out

$$(x^3 - 2x^2 + 3x + 4) \div (x + 3) \quad (8 \text{ marks})$$

(b) Use synthetic division to work out

$$(x^4 + 2x^3 + x^2 - 2x - 4) \div (x + 2) \quad (4 \text{ marks})$$

(c) Consider the polynomial $P(x) = x^3 + 2x^2 + Ax - 6$

(i) Find the value of A given that $(x + 1)$ is a factor of $P(x)$. (2 marks)

(ii) By first dividing $P(x)$ by $(x + 1)$, factorise $P(x)$ completely. (4 marks)

(iii) Hence find the roots of $P(x) = 0$. (2 marks)

QUESTION B7

(a) Find the following sums:

(i) $8 + 16 + 32 + \dots + 8192$

(ii) $\sum_{n=1}^{50} 3n$ (10 marks)

(b) (i) Find the 9th term in the binomial expansion

$$\left(2 + \frac{1}{y}\right)^{20} \quad (5 \text{ marks})$$

(ii) Find the term involving x^{-5} in $\left(x - \frac{2}{x}\right)^{11}$ (5 marks)