

---

UNIVERSITY OF SWAZILAND



SUPPLEMENTARY EXAMINATION, 2017/2018

---

**BASS I, B.Ed I, B.Comm I**

---

**Title of Paper** : Algebra, Trigonometry and Analytic Geometry

**Course Number** : MAT 107/MAT 121/MS 101

**Time Allowed** : Three (3) Hours

**Instructions**

1. This paper consists of SIX (6) questions in TWO sections.
2. Section A is **COMPULSORY** and is worth 40%. Answer ALL questions in this section.
3. Section B consists of FIVE questions, each worth 20%. Answer ANY THREE (3) questions in this section.
4. Show all your working.
5. Start each new major question (A1, B2 – B6) on a new page and clearly indicate the question number at the top of the page.
6. You can answer questions in any order.
7. Indicate your program next to your student ID.

**Special Requirements: NONE**

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

**SECTION A [40 Marks]: ANSWER ALL QUESTIONS****QUESTION A1 [40 Marks]**

- a) Use the remainder theorem to find the remainder when  $P(x) = 7x^3 + 3x^2 + 9x - 5$  is divided by  $x - 2$  [4]
- b) Solve the exponential equation  $4^{7x} = 16^{6x-1}$  [5]
- c) Prove that  $\cot(x) + \tan(x) = \sec(x) \csc(x)$ . [5]
- d) Find the fourth term in the expansion of  $(2x - 3y)^7$ . [3]
- e) Using the method of mathematical induction, prove that

$$1 + 3 + 5 + \dots + (2n - 1) = n^2$$

- for all positive values of  $n$ . [5]
- f) Find the first three terms of an arithmetic progression whose 10th term is 5 and 18th term is 77 [5]
- g) The sum of the first six terms of an arithmetic progression is zero and the fourth term is 2. Find the sum of its first 30 terms. [5]
- h) Find the equation of a straight line passing through the point (1,-2) and parallel to the straight line  $3x + 2y - 7 = 0$ . [5]
- h) Express  $2(\cos(60) + i \sin(60))$  in the Cartesian form  $a + bi$ . [3]

**SECTION B: ANSWER ANY *THREE* QUESTIONS****QUESTION B2 [20 Marks]**

- a) The polynomial  $Ax^3 + Bx^2 - 16x + 20$  leaves a remainder of 8 when divided by  $x - 3$  and a remainder of 36 when divided by  $x + 4$ . Find  $A$  and  $B$ . [8]
- b) Find all the roots of the equation  $x^4 - x^3 - 7x^2 + x + 6 = 0$ . [12]

**QUESTION B3 [20 Marks]**

- a) Solve the logarithmic equation [8]
- $$\log_2(x + 1) - \log_2(x) = \log_2 7.$$
- b) Mrs. Mavuso wishes to have E2500 in 5 years to pay deposit on a house. At what interest rate compounded quarterly must E1375 be invested now to achieve this goal? [6]
- c) How long will it take an amount of E5000 to grow to E8000 in an investment scheme that pays 12.102% compounded semi-annually? [6]

**QUESTION B4 [20 Marks]**

- a) i. Find the number of terms in the geometric progression 6, 12, 24, ..., 1536 [6]  
ii. Write the rational number 5.31313131... as the ratio of two integers [6]
- b) Find the term with  $x^{10}$  in the expansion of  $\left(x^3 - \frac{2}{x}\right)^6$  [8]

**QUESTION B5 [20 Marks]**

a) i Show that the equations  $2 \sin x = \frac{4 \cos x - 1}{\tan x}$  can be expressed as

$$6 \cos^2 x - \cos x - 2 = 0$$

[6]

ii Hence solve the equation  $2 \sin x = \frac{4 \cos x - 1}{\tan x}$  for all  $x$  between  $0^\circ$  and  $360^\circ$ .

[6]

b) Evaluate the complex number  $\sqrt{5 - 12i}$  and express your results in the form  $z = x + iy$  [8]

**QUESTION B6 [20 Marks]**

Solve the system of linear equations

$$2x_1 + 2x_2 - x_3 = -1$$

$$2x_1 + 5x_3 = -13$$

$$4x_1 - 5x_2 - 2x_3 = -29$$

using Cramer's rule.

[20]

---

END OF EXAMINATION PAPER