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UNIVERSITY OF ESWATINI



RESIT EXAMINATION, 2019/2020

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

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**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 whether you are full time or part time student and indicate your program on your answer booklet.

**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) Find the equation of the line that is parallel to  $y = 3x - 5$  and passes through the point  $(0, -4)$ . [5]
- b) Find the sixth term of the geometric progression  $3, 6, 12, \dots$  [5]
- c) Write and simplify the first two terms in the expansion of  $\left(\frac{2}{xy} + y\right)^8$ . [5]
- d) Suppose that  $z = -2 - 3i$ , find  $|z|$ . [5]
- e) Given that  $\sin(x) = \frac{1}{4}$  and  $\cos(x) = \frac{1}{3}$ , find  $\tan(x)$ . [3]
- f) Solve for  $x$  [5]

$$\log_5(x - 1) = 2.$$

- g) Solve the following linear system of equations using Cramer's rule. [7]

$$7r - 2s = 23$$

$$-4s + 5r = 19$$

- h) Find the zeros of the polynomial [5]

$$q(x) = (4x - 2)(x^2 - 4).$$

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<b>SECTION B: ANSWER ANY <i>THREE</i> QUESTIONS</b>
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**QUESTION B2 [20 Marks]**

- a) Solve the equation  $z^2 + 2iz + 4 = 0$  and simplify your answer. [6]
- b) Find the equation of the line that is perpendicular to the line  $y = 2 - 4x$  and passing through the point  $(1, -1)$ . [6]
- c) Show that [8]

$$\frac{1}{1 + \sin x} + \frac{1}{1 - \sin x} = 2 \sec^2(x).$$

**QUESTION B3 [20 Marks]**

- a) Find the tenth term of an arithmetic progression  $-3, 1, 5, \dots$  [6]
- b) Find the sum of the first eight terms of the geometric progression  $3, 12, 48, \dots$  [6]
- c) Prove by mathematical induction that the following formula [8]

$$1 + 2 + 3 + \dots + n = \frac{n(n+1)}{2}$$

is valid for all positive integers.

**QUESTION B4 [20 Marks]**

- a) Solve the logarithmic equation  $\log_2(x+2) + \log_2(x-5) = 3$ . [8]
- b) What amount must Lindiwe invest at 3% compounded quarterly, to accumulate E2850.00 at the end of 4 years? [12]

**QUESTION B5 [20 Marks]**

- a) Find the coefficient of the term involving  $x^8$  in the expansion of  $(2x^4 - 3)^6$ . [8]
- b) Solve the following linear system of equations using Cramer's rule. [12]

$$\begin{aligned} x + y - z &= 7 \\ 4x - y + 5z &= -4 \\ 2x + 2y - 3z &= 0 \end{aligned}$$

**QUESTION B6 [20 Marks]**

- a) Given that  $z_1 = -1 - 3i$  and  $z_2 = 2 - i$ , find  $\frac{z_1}{z_2}$ . [6]
- b) Find the radius  $r$  and center of the circle given by  $(x+3)^2 + y^2 = 16$ . [6]
- c) Given that  $\sin(A) = \frac{1}{2}$  and  $\cos(A) = \frac{1}{4}$ , find  $\tan^2(A)$ . [4]
- d) Find the quotient of  $p(x) = x^3 - 2x^2 + 5$  when divided by  $x - 3$ . [4]