UNIVERSITY OF ESWATINI

RESIT EXAMINATION, 2020/2021

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

Title of Paper : Algebra, Trigonometry and Analytic Geometry

Course Number : MAT 107

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.

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SECTION A [40 Marks]: ANSWER ALL QUESTIONS

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QUESTION A1 [40 Marks]

a) Find the equation of the line that is perpendicular to $y = 3x - 5$ and passes through the point $(0, -4)$.   [5]

b) Find the fifth term of the geometric progression $3, 6, 12, \ldots$ [5]

c) Write and simplify the first three terms in the expansion of $\left(\frac{2}{xy} + y\right)^8$.   [5]

d) Suppose that $z = 3 + i$, find $|z|$.   [5]

e) Given that $\sin(x) = \frac{1}{7}$ and $\cos(x) = \frac{1}{5}$, find $\tan(x)$.   [3]

f) Solve for x [5]

$$\log_2(x - 6) = 3.$$

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

$$7r - 2s = 23$$
$$-4s + 5r = 19$$

h) Find the zeros of the polynomial   [5]

$$q(x) = (6x - 12)(x^2 - 16).$$

SECTION B: ANSWER ANY *THREE* QUESTIONS

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 parallel to the line $y = 2 - 4x$ and passing through the point $(4, -3)$.   [6]

c) Show that   [8]

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

QUESTION B3 [*20 Marks*]

a) Solve the logarithmic equation   [8]

$$\log_3(x - 4) + \log_3(x + 4) = 2.$$

b) $E693.00$ is invested at 2.46% compounded monthly. After how many years will the investment exceed $E45000.00$?   [12]

QUESTION B4 [*20 Marks*]

a) i) Find the nth term of an arithmetic progression whose $9th$ term is 16 and $40th$ term is 47.   [6]

ii) The first term of a geometric progression is 11 and the common ratio is 9. Find the sum of the first twenty terms.   [6]

b) Find the first three terms of the expansion of $(x^2 - 2y)^9$.   [8]

QUESTION B5 [*20 Marks*]

a) Prove by mathematical induction that the following formula   [8]

$$1(2) + 2(3) + 3(4) + \cdots + n(n + 1) = \frac{n(n + 1)(n + 2)}{3}$$

is valid for all positive integers.

b) Solve the following linear system of equations using Crammer's rule.   [12]

$$x + y - z = 6$$
$$3x - 2y + z = -5$$
$$x + 3y - 2z = 14$$

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QUESTION B6 [20 Marks]

a) Given that $z_1 = -1 - 3i$ and $z_2 = 2 - i$, find $\dfrac{z_1}{z_2}$. [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]

—————————————END OF EXAMINATION PAPER—————————————