

University of Swaziland

Supplementary Examination, July 2018

B.A.S.S I

Title of Paper : Elementary Quantitative Techniques I

Course Number : MAT101

Time Allowed : Three (3) Hours

Instructions

1. This paper consists of TWO sections.
 - a. **SECTION A (COMPULSORY): 40 MARKS**
Answer ALL QUESTIONS.
 - b. **SECTION B: 60 MARKS**
Answer ANY THREE questions.
Submit solutions to **ONLY THREE** questions in Section B.
2. Show all your working.
3. Start each question on a fresh page.
4. Non programmable calculators may be used (unless otherwise stated).
5. Leave all non exact answers correct to 3 decimal places unless told otherwise.
6. A formula sheet is provided on the last page.
7. Special requirements: None.

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

SECTION A

Answer ALL questions from section A.

A1. (a) Simplify:

i. $(ab^{-2})(a^{-2}b)^2$. [2] ii. $\frac{2x-4}{x^2+x-6}$. [3]

iii. $\frac{1}{x} + \frac{2}{x-1}$. [3] iv. $\ln x^2 + \ln(2x)$ [2]

(b) Evaluate

i. $\log_7 1$. [2] ii. $\begin{vmatrix} 3 & -4 \\ 2 & 5 \end{vmatrix}$. [2]

iii. ${}^{15}C_{10}$. [2] iv. $\log_{10} 0.01$. [2]

(c) Factorise completely $3x^2 + 4x - 4$. [4]

(d) Evaluate $\begin{vmatrix} 10 & 0 & -2 \\ 3 & 0 & 5 \\ 4 & -1 & 7 \end{vmatrix}$. [5]

(e) Solve

$$2a + 3p = 9,$$

$$4a + p = 13.$$

[5]

(f) Find the equation of the line passing through $(0, 1)$ and parallel to the line $3x + y = 3$. [3]

(g) For the Geometric progression $3, -12, 48, \dots$, find

i. the formula for the n th term. [3]

ii. T_{10} . [2]

SECTION B

Answer any THREE questions from section B.

B2. Consider the AP 40, 34, 28, . . . ,

(a) Write down the next two terms. [4]

(b) Find a formula for the n th term. [6]

(c) Use the formula in b. to find the 51st term. [4]

(d) Find the sum of the first 30 terms. [6]

B3. Use Cramer's rule to solve the following linear system of equations.

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

[20]

B4. Given the following expression $(x + \frac{1}{x})^{20}$, find

(a) the first 4 terms. [8]

(b) the 16th term . [6]

(c) the middle term. [6]

B5. (a) Find the equation of the line parallel to the line $6x - 2y = 1$ and passes through the point $(3, 4)$. [6]

(b) Find the amount at the end of 5 years on an original principal of $E5000$ at 6% if the interest is

i. simple interest. [4]

ii. compounded semiannually. [5]

iii. compounded continuously. [5]

B6. Solve

(a) $\ln(5x - 9) = 0$ [5]

(b) $\log_2(x + 2) = 2$ [5]

(c) $5^{x+2} = 625$ [5]

(d) $e^{x-1} = 110$ [5]

END OF EXAMINATION

Formula Sheet

Arithmetic Progressions:

$$T_n = T_1 + (n - 1)d, \quad S_n = \frac{n}{2}[T_1 + T_n], \quad S_n = \frac{n}{2}[2T_1 + (n - 1)d].$$

Geometric Progressions:

$$T_n = T_1 r^{n-1}, \quad S_n = \frac{T_1(1 - r^n)}{1 - r}.$$

Binomial Theorem:

$$(a + b)^n = a^n + nC_1 a^{n-1}b + nC_2 a^{n-2}b^2 + nC_3 a^{n-3}b^3 + \dots + b^n.$$

rth term of $(a + b)^n = nC_{r-1} a^{n-r+1} b^{r-1}.$

Matrices:

$$\begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$$

logarithms and Exponential Functions:

$$\log_b x = y \Leftrightarrow x = b^y.$$

$$\log_b(AB) = \log_b A + \log_b B.$$

$$\log_b \left(\frac{A}{B} \right) = \log_b A - \log_b B.$$

$$\log_b A^n = n \log_b A.$$

The Quadratic Formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

Simple Interest:

$$A = P(1 + rn)$$

Compound Interest:

$$A = P(1 + r)^n, \quad A = P(1 + r/s)^{ns}$$

Continuous Compound Interest:

$$A = Pe^{rn}$$