UNIVERSITY OF SWAZILAND

FINAL EXAMINATION, 2018/2019

BASS I

Title of Paper : Elementary Quantitative Techniques I

Course Number : MAT101

Time Allowed : Three (3) Hours

Instructions

1. This paper consists of TWO (2) Sections:
   a. SECTION A (40 MARKS)
      - Answer **ALL** questions in Section A.
   b. SECTION B
      - There are FIVE (5) questions in Section B.
      - Each question in Section B is worth 20 Marks.
      - Answer **ANY THREE (3)** questions in Section B.
      - If you answer more than three (3) questions in Section B, **only the first three questions answered in Section B will be marked.**
2. Show all your working.
3. Start each question on a fresh page
4. Non programmable calculators may be used (unless otherwise stated)
5. A formula sheet is provided on the last page

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

A1. (a) Use Cramer's rule to solve the following

$$\begin{aligned} 2x + 8y + z &= -4 \\ 3x - y + 2z &= 8 \\ 4x + 4y - 5z &= -10 \end{aligned}$$

(7)

(b) Use synthetic division to find the quotient and remainder

$$(x^5 - 7x^2 - 13x + 3) \div (x + 2)$$

(7)

(c) Compute $\begin{vmatrix} 1 & 2 & 2 \\ 1 & 3 & 1 \\ 1 & 3 & 2 \end{vmatrix}$ (3)

(d) Find the value of $1 + 2 + 4 + 8 + \cdots + 32768$ (3)

A2. (a) Solve the simulteneous equations

$$\begin{aligned} 3x - 2y &= 11 \\ 5x + 4y &= 11 \end{aligned}$$

(6)

(b) Find an equation for each of the following straight lines. Write your answer in the form $y = mx + c$

(i) through $(2, 5)$ and $(8, 8)$ (4)

(ii) through $(6, -1)$ and perpendicular to $3x - 2y = -12$ (4)

(c) Use the binomial theorem to expand and simplify

$$(x + 3y)^5$$

(6)

SECTION B: Answer Any *THREE* Questions

QUESTION B1 [*20 Marks*]

B1. (a) Find the 10th term in

$$\left(x - \frac{1}{x}\right)^{20}$$

(5)

(b) Use the quadratic formula to solve

$$2x^2 + x - 6 = 0$$

(5)

(c) A parent sets up a fund for a child by making monthly deposits. He deposits E350, E400, E450 at the end of 1st, 2nd and 3rd months, respectively. Find

(i) The instalment after 2 years

(ii) When the instalment will reach E109 500.

(iii) Total deposits after 3 years (3,3,4)

QUESTION B2 [*20 Marks*]

B2. (a) Use long division to work out

$$(x^3 - 2x^2 + 3x + 4) \div (x + 3)$$

(8)

(b) Use synthetic division to work out

$$(x^4 + 2x^3 + x^2 - 2x - 4) \div (x + 2)$$

(4)

(c) Consider the polynomial $P(x) = x^3 + 2x^2 + Ax - 5$

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

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

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

QUESTION B3 [*20 Marks*]

B3. (a) Consider the matrices $A = \begin{pmatrix} 4 & -3 \\ 2 & 1 \end{pmatrix}$ $B = \begin{pmatrix} 2 & 5 \\ 3 & -6 \\ -1 & 4 \end{pmatrix}$, $C = \begin{pmatrix} 8 & 2 & -3 \\ 1 & -5 & 4 \end{pmatrix}$

Find (i) $|A|$

(ii) AB^T

(iii) BC

(iv) CB (12)

(b) Use Crammer rule to solve

$$\begin{aligned} 4x + 3y - 2z &= -1 \\ x + 2y + 4z &= 12 \\ 3x + 4y + z &= 5 \end{aligned}$$

(8)

QUESTION B4 [*20 Marks*]

B4. (a) Find the values of A and B such that both $(x + 1)$ and $(x + 2)$ are factors of

$$p(x) = x^4 + Ax^3 - 7x^2 + Bx + 12$$

(10)

(b) Consider the straight line, H given by $18x + 3y = -10$

(i) Find the y-intercept of H (3)

(ii) Find the gradient (slope) of H (3)

(iii) find the equation of a line parallel to H passing through the point $(-2, 1)$ (4)

QUESTION B5 [*20 Marks*]

B5. (a) Prove the following trig identities

(i) $\sin\theta + \cos\theta \cot\theta = cosec\ \ \theta$ (5)

(ii) $\dfrac{(\sec\theta - 1)(\sec\theta + 1)}{\tan\theta} = \tan\theta$ (5)

(b) (i) If $\tan\theta = \frac{3}{4}$ and θ is in $QIII$, find $\sin\theta$ and $\cos\theta$ (5)

(ii) If $\sin\theta = \frac{12}{13}$ and θ is in QII, find the other 5 ratios. (5)

END OF EXAMINATION PAPER