University of Swaziland

Supplementary Examination, July 2011

Bass I

Title of Paper : Elementary Quantitative Techniques I

   Course Number : MS011

   Time Allowed : Three (3) hours

   Instructions :

1. This paper consists of SEVEN questions.

2. Each question is worth 20%.

3. Answer ANY FIVE questions.

4. Show all your working.

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

Question 1

(a) Prove the following identities.

    i) $\cos^2 x - \sin^2 x = 2\cos^2 x - 1$ [5]

    ii) $\dfrac{1 - \tan^2 \theta}{\cot^2 \theta - 1} = \tan^2 \theta$ [5]

(b) Solve $2\cos x - 1 = 0, \quad 0 \leqslant x < 360^0.$ [5]

(c) Given that $\log_7 2 = 0.356$ and $\log_7 3 = 0.565$, find

    i) $\log_7 \sqrt{3}$ [2]

    ii) $\log_7 14$ [3]

Question 2

(a) Use the Remainder Theorem to find the remainder when $P(x) = 3x^2 - 2x + 5$ is divided by $x + 1$.   [5]

(b) Use long division to find the quotient and remainder when $P(x) = 3x^3 + 5x^2 + 2x - 1$ is divided by $x - 3$. [8]

Solve

$$\log_2(2x^2 + 3x + 5) = 3 + \log_2(x + 1).$$ [7]

Question 3

A trader bought paraffin for E1000. He paid Ex for each litre of paraffin.

(a) Find, in terms of x, an expression for the number of litres he bought.   [4]

(b) Due to a leak, he lost 6 litres of paraffin. He sold the remainder of paraffin for E1 more per litre than he paid for it. Write down an expression, in terms of x, for the sum of money he received.   [5]

(c) He made a profit of E40. Write down an equation in x to represent this information. [7]

(d) Write as a single fraction.

$$\frac{x}{x+1} - \frac{2}{x+3}.$$ [4]

Question 4

(a) Factorise the following expressions.
  i) $6x^2y^4r^7 - 12x^5yr^4$ [4]
  ii) $3k^2x - 15k^2y - x + 5y$ [4]

(b) Simplify
  i) $\dfrac{y^3 + 3y + xy - 10 - 2x}{y - 2}$ [6]

  ii) $\dfrac{\sin^2\theta - 7\sin\theta + 12}{\sin\theta - 3}$ [6]

(c) Show that $x = -1$ is a root of the polynomial $p(x) = x^2 - x^2 + 2.$ [5]

Question 5

(a) Given $f(x) = \dfrac{4x + q}{5x + 3}$, where q is a constant, find q if
  i) $f(-2) = 3$ [5]
  ii) $f^{-1}(4) = 7$ [7]

(b) Find the equation of the straight line that is perpendicular to the line $ay + bx + c$ (where a, b and c are constants) and passing through the point $(-2, 7)$. [8]

Question 6

(a) The distance between two towns A and B is 180km. Mr Dlamini drove from A to B at an average speed of 50km/h.

   i) Find the time, in hours, that he took to complete the journey from A and B. [5]

   On the return journey, his average speed was 10km/h greater than his speed from A to B.

   ii) What is his speed for the journey from B to A? [2]

   iii) Give the time, in hours, that he took for the journey from B to A. [5]

(b) If $\tan \theta = \frac{4}{3}$ and $\cos \theta$ is negative, find the values of $\cos \theta$ and $\sin \theta$. [8]

Question 7

(a) What amount must Themba invest at 12% compounded annually, to accumulate E3000 at the end of 10 years? [7]

(b) What annual interest rate compounded annually is required to raise E4000 to E5000 *in 4 years?* [8]

(c) Use synthetic division to find the quotient and remainder when $P(x) = x^4 + 4x = 5$ is divided by $x + 3$. [5]