University of Swaziland

Final Examination, December 2009

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) Factorise $x^2 - b^2 + x + b$ completely. [6]

(b) Simplify each of the following

  i. $\dfrac{y^2 + 3y + xy - 10 - 2x}{-2 + y}$ [8]

  ii. $\dfrac{\cos^2 x + \cos x - 6}{-2 + \cos x}$ [6]

Question 2

(a) Given the function

$$f(x) = \frac{2x - q}{x + 3}, \quad x \neq -3$$

where q is a constant.
Find

  i) $f(0)$ [2]

  ii) q if $f^{-1}(3) = 7$. [8]

(b) Use long division to find the quotient and remainder when $P(x) = x^4 + 2x^2 + x - 1$ is divided by $D(x) = x - 2$. [10]
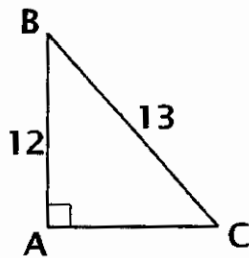
Question 3

(i) Consider the straight line defined by $2y - qx = 3$, where q is a constant. Find (in terms of q) the equation of the straight line perpendicular to $2y - qx = 3$, and passing through the point $(-2, 3)$. [10]

(b) State the Remainder Theorem. [3]

(c) Use the remainder theorem to find the remainder when $P(x) = 3x^2 - 4x + 1$ is divided by $2x - 4$. [7]

Question 4

(a) Consider the triangle below, and then answer the following questions.

Find the exact values of (leave your answers as fractions):

i. $\sin A\hat{B}C$ [2]

ii. $\sec B\hat{C}A$ [2]

iii. $\cot A\hat{B}C$ [2]

(b) Prove the following identities

i. $\cot\theta + \tan\theta \equiv \csc\theta\sec\theta$ [7]

ii. $\dfrac{\cot\theta}{\tan\theta} + 1 \equiv \csc^2\theta.$ [7]

Question 5

(a) Mark the points corresponding to the following complex numbers on the complex plane.

i. $2 + 3i$ [3]

ii. $-1 + i$ [3]

b. Express the following in the form $a + ib$.

i. $(3 + i)(4 - 2i)$ [4]

ii. $\left(\dfrac{1 - i}{1 + i}\right)^2$ [5]

c. Find the sum of the first 12 terms of the GP $2,\ 6,\ 18, \cdots$. [5]

Question 6

(a) Given that $\log_7 2 = 0.356$ and $\log_7 3 = 0.565$, find the values of

i. $\log_7 \left(\frac{2}{3}\right)$ [2]

ii. $\log_7 14$. [3]

(b) Solve for x, given

i. $2^{x+3} = 5$ [4]

ii. $2 \log_5 x = \log_5 (2x + 3)$ [5]

iii. $\log_3(x^2 + 2) = 1 + \log_3(x + 2)$ [6]

Question 7

(a) The price of petrol was increased by 10% in March and then reduced by 10% in November. Find the percentage change in price between April and November. [4]

(b) Find the balance after 5 years if E6000 is invested into an account offering 7% interest compounded

    i.   semi-annually   [4]

    ii.   quarterly   [4]

(c) After how many years will a principal amount of E7000 triple if invested into an account offering 6% interested compounded quarterly? [8]