University of Swaziland

Final Examination, December 2010

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) Find the equation of the straight line which is parallel to $3x - 2y - 4 = 0$ and passes through the point $(2, 4)$.

[5]

(b) Write down the equation of the straight line perpendicular to $y = 1 - 2x$ and passing through the point $(-2, -2)$.

[5]

(c) Use long division to find the quotient and the remainder:

$$\left(4x^3 - 3x^2 + x + 7\right) \div (x - 2).$$

[5]

(d) Use synthetic division to find the quotient and the remainder:

$$\left(2x^3 + 7x^2 - 5\right) \div (x + 3).$$

[5]

Question 2

(a) Prove the following identities.

i) $\quad \sin\theta + \cos\theta \cot\theta = \csc\theta$

[5]

ii) $\quad \csc\theta - \sin\theta = \cot\theta \cos\theta$

[5]

(b) Find x and y if

i) $\quad y = 27x \quad$ and $\quad \log_3 x + \log_3 y = 7$

[5]

ii) $\quad y = 3\log_4 4 \quad$ and $\quad y = \log_4(15x + 4)$

[5]

Question 3

(a) Express as a single fraction in its simplest form.

   i) $\dfrac{m}{12} + \dfrac{2m+n}{4} - \dfrac{m-2n}{3}$ [5]

   ii) $\dfrac{1}{x-1} + \dfrac{2x}{1-x^2}$ [5]

(b) If $\cos\theta = \frac{12}{13}$ find the possible values of $\sin\theta$ and $\tan\theta$.

     [5]

(c) Find the value of x

$$4^x = 256.$$ [5]

Question 4

(a) A sum of money is divided into parts in the ration 5 : 7. If the smaller amount is E200, find the larger amount.

     [5]

(b) You have written a test with a total of 60 marks.

   i) If your score was 26 marks, what percentage is this?

     [5]

   ii. If the pass mark is 50%, how many marks do you need to pass?   [5]

(c) Show that $x = -1$ is a root of the polynomial
$p(x) = x^3 - x^2 + 2$.   [5]

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]