UNIVERSITY OF SWAZILAND

SUPPLEMENTARY EXAMINATION 2007

MS012 Year. I

TITLE OF PAPER: ELEMENTARY QUANTITATIVE METHOD(

COURSE NUMBER: MS012

TIME ALLOWED: THREE HOURS

INSTRUCTIONS: 1. This paper consists of SEVEN
                        questions on FOUR pages.

                     2. Answer any FIVE questions.

                     3. Calculators may be used.

SPECIAL REQUIREMENTS: NONE

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

Question 1

(a) Show that the equation $a^2x^2 + ax + 1 = 0$ can never have real roots.

[**5 marks**]

(b) The polynomial $x^3 + ax^2 + bx - 1$ is divided by $x - 2$ and $x + 1$. The remainder are 7 and 4 respectively. Find the value of a and b.

[**8 marks**]

(c) Solve the simultaneous equations $x + 2y = 7$ and $x^2 - 4x + y^2 = 1$

[**7 marks**]

Question 2

(a) Factorise $x^3 - 4x^2 + 5x - 2$. Hence solve the equation $x^3 - 4x^2 + 5x - 2 = 0$.

[**12 marks**]

(b) Use long division to find the quotient and remainder when $2x^4 + 3x^2 + x + 4$ is divided by $x - 1$.

[**8 marks**]

Question 3

(a) Evaluate the following limits

(i) $\lim\limits_{x \to 0} \dfrac{x^2 + x}{x}$

[4 marks]

(ii) $\lim\limits_{x \to -1} \dfrac{x^2 - 1}{x + 1}$

[4 marks]

(iii) $\lim\limits_{x \to \infty} \dfrac{x + 2}{x^2 + 1}$

[4 marks]

(b) Use the limit definition of the derivative to find $f'(x)$ is $f(x) = x^2 + 1$

[8 marks]

Question 4

(a) Find $f'(x)$ for each of the following functions
    (i) $f(x) = 2x^7 + 3x^2 + 4$

[3 marks]

(ii) $f(x) = e^{4x+2} + x \cos x$

[4 marks]

(iii) $f(x) = (x + \sin x)^{11}$

[4 marks]

(iv) $f(x) = \dfrac{x + 4}{x^2 + 1}$

[4 marks]

(b) If $y = (ax + 2)^2$ and $\dfrac{d^2 y}{dx^2} = 18$, find the value(s) of a.

[5 marks]

Question 5

(a) Evaluate the following integrals

(i) $\int (2x^4 + x^2 + 5)dx$

[4 marks]

(ii) $\int \frac{1}{x}dx$

[3 marks]

(iii) $\int e^{3x+5}dx$

[5 marks]

(b) Find the area enclosed by the curve $f(x) = -x^2 + x + 2$ and the $x-$axis.

[8 marks]

Question 6

(a) Sketch the curve $f(x) = x^2 - 4x + 3$ by considering x and y intercepts, turning points, intervals of decrease and increase.

[10 marks]

(b) Show that the function $f(x) = x^3 + x^2 + 5x + 6$ is always increasing.

[4 marks]

(c) If $R = \frac{v^2}{4} + \frac{500}{v}$, find the value of v for which R is a minimum.

[6 marks]

Question 7

(a) Solve the equation

$$\log_5 x = 1 - \log_5(x - 4)$$

[**5 marks**]

(b) If the 12th term of an arithmetic progression is double the 5th term, find the common difference, given that the first term is 7.

[**7 marks**]

(c) If $x-2$, $x-1$ and $3x-5$ are the first three terms of a geometric progression, find

(i) the possible values of x.

(ii) the common ratio for each of the possible geometric progressions.

[**8 marks**]

******** *END OF EXAMINATION* ********