UNIVERSITY OF SWAZILAND
Faculty of Health Sciences

DIPLOMA IN ENVIRONMENTAL HEALTH

FINAL EXAMINATION PAPER 2009/2010

TITLE OF PAPER	:	ALGEBRA FOR HEALTH SCIENCES
COURSE TITLE	:	HSM 111
DURATION	:	2 HOURS
MARKS	:	80
INSTRUCTIONS	:	READ QUESTIONS & INSTRUCTIONS CAREFULLY
	:	ANSWER ANY FOUR (4) QUESTIONS
	:	EACH QUESTION CARRIES 20 MARKS
	:	WRITE NEATLY & CLEARLY
	:	SHOW ALL YOUR WORKING
	:	NO PAPER SHOULD BE BROUGHT INTO NOR OUT OF THE EXAMINATION ROOM
	:	BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER

DO NOT OPEN THIS QUESTION PAPER UNTIL PERMISSION IS GRANTED BY THE INVIGILATOR

QUESTION 1

1. (a) Find all the roots of the polynomial

$$x^3 - 5x^2 - 2x + 24 = 0$$

[8 marks]

(b) Determine the centre and radius of the circle

$$x^2 + y^2 - 6x + 8y - 11 = 0$$

[8 marks]

(c) Find an equation of the line perpendicular to the line $y + 2x = 3$ and passing through the point (1,3) [4 marks]

QUESTION 2

2. (a) Solve each of the following equations for x

i. $3^{2x-3} = 27$ [4 marks]

ii. $\log_3(x + 6) - \log_3(x + 2) = \log_3 x$ [4 marks]

iii. $\log_9 27 = x$ [4 marks]

(b) Expand and simplify $(2x + 3y)^5$ [8 marks]

QUESTION 3

3. (a) Prove the following identities

i. $\tan A + \cot A = \sec A \csc A$ [5 marks]

ii. $(1 - \cos A)(1 + \sec A) = \sin A \tan A$ [5 marks]

(b) Solve the following trigonometric equations giving all solutions between 0^o and 360^o

$$2\cos^2 x - \sin x - 1 = 0$$

[10 marks]

QUESTION 4

4. (a) Use Cramer's rule to solve the following linear system of equations

$$\begin{aligned} 2x_1 + x_2 - x_3 &= 5 \\ 3x_1 - 2x_2 + 2x_3 &= -3 \\ x_1 - 3x_2 - 3x_3 &= -2 \end{aligned}$$

[20 marks]

QUESTION 5

5. (a) Use the synthetic division method to divide

$$x^5 - 3x^3 + 4x - 3 \quad \text{by} \quad x + 2$$

[6 marks]

(b) The population of Mbabane varies according to the equation

$$P = 100000e^{0.15t}$$

where t is time in years. Find the time it will take for the population to double. [7 marks]

(c) Find the interest rate needed for E6 000 to grow to E8 000 in 3 years if the interest is compounded annually. [7 marks]

QUESTION 6

6. (a) The fourth term of an A.P. is 14 and the ninth term is 34. Find the thirteenth term. [6 marks]

(b) Convert the repeating decimal 3.24242424... into an equivalent common fraction. [6 marks]

(c) Write the first four terms of the binomial expansion of $\frac{1}{\sqrt{1-x}}$ [8 marks]

QUESTION 7

7. (a) If the matrices A and B be given by

$$A = \begin{pmatrix} 1 & -2 \\ 4 & 3 \\ 6 & 5 \\ 3 & 1 \end{pmatrix} \quad , \quad B = \begin{pmatrix} 1 & 5 \\ -2 & 4 \\ 1 & 3 \\ 3 & 1 \end{pmatrix}$$

calculate the following

i. $A + B$ [4 marks]

ii. A^T [4 marks]

iii. $A^T B$ [4 marks]

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

END OF EXAMINATION