UNIVERSITY OF SWAZILAND

FINAL EXAMINATIONS 2008/9

B.A.S.S. I / D.COM I

TITLE OF PAPER	:	INTRODUCTORY MATHEMATICS FOR BUSINESS
COURSE NUMBER	:	MS 101 AND IDE MS101
TIME ALLOWED	:	THREE (3) HOURS
INSTRUCTIONS	:	1. THIS PAPER CONSISTS OF SEVEN QUESTIONS.
		2. ANSWER ANY FIVE QUESTIONS
		3. USEFUL FORMULAE ARE PROVIDED AT THE END OF THE QUESTION PAPER.
SPECIAL REQUIREMENTS	:	NONE

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

QUESTION 1

1. (a) Find k such that $(x+1)$ is a factor of $P(x) = kx^3 - x^2 + x - 2$ [4 marks]

   (b) Find all the real roots of the polynomial

   $$x^3 + 4x^2 - 7x - 10 = 0$$ [6 marks]

   (c) Solve for x in each of the following equations

   i. $\log_x \left(\frac{1}{8}\right) = 3$ [5 marks]

   ii. $3^{1-x} = 7^{-x}$ [5 marks]

QUESTION 2

2. (a) How long will it take E2900 to grow to E5900 if the annual rate of interest is 16.5% and the interest is compounded monthly? [5 marks]

   (b) At what interest rate (compounded annually) will a sum of E4000 grow to E6000 in 5 years? [5 marks]

   (c) A sum of E1000 is invested at an interest rate of 5.5% compounded monthly. How many years will it take until the sum exceeds E2500. [5 marks]

   (d) Solve the following logarithmic equation

   $$\log x + \log(x + 3) = 1$$

   [5 marks]

QUESTION 3

3. (a) Prove the trigonometric identity

$$\frac{\sin x}{1 + \cos x} + \frac{1 + \cos x}{\sin x} = 2\csc x$$

[4 marks]

(b) Solve the trigonometric equation

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

giving all solutions between 0° and 360°. [6 marks]

(c) The 6th term of an arithmetic series is 11 and the 5th term is 20. Find the first term and the common difference [5 marks]

(d) Find the sum of the following series

$$-21, -9, 3, \ldots\ldots, 219$$

[5 marks]

QUESTION 4

4. (a) Find the centre and radius of the circle described by the equation [5 marks]

$$x^2 + y^2 - 4x + 2y + 1 = 0$$

(b) Given the points $A = $ (-3,4) and $B = $ (1,3). Find the following;

i. The equation of the line containing A and B. [3 marks]

ii. The equation of the circle with centre A and passing through the point B. [5 marks]

(c) Find the coefficient of x^{-13} in the expansion of $\left(3x^2 - \dfrac{1}{2x}\right)^{22}$ [7 marks]

5. (a) Calculate $A^T B$ if the matrices A and B be given by

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

[6 marks]

(b) Use Cramer's rule to solve the following system of equations

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

[14 marks]

QUESTION 6

6. (a) The 4th term of a geometric series is 16 and the 2nd term is 2. Find the first term and the common ratio. [4 marks]

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

(c) Expand the binomial $(2x + y^2)^6$ [5 marks]

(d) Write the first four terms of the binomial expansion of $\dfrac{1}{\sqrt{1-x}}$ [5 marks]

QUESTION 7

7. (a) By the method of mathematical induction, prove that the following formula is valid for all positive integral values of n.

$$2 + 2^2 + 2^3 + \cdots + 2^n = 2^{n+1} - 2$$

[10 marks]

(b) Solve the quadratic equation

$$z^2 - 3z + 3 - i = 0$$

[10 marks]

END OF EXAMINATION

Useful Formulas

1. $\sin^2 \theta + \cos^2 \theta = 1$
2. $\sin(A + B) = \sin A \cos B + \cos A \sin B$
3. $\sin(A - B) = \sin A \cos B - \cos A \sin B$
4. $\cos(A + B) = \cos A \cos B - \sin A \sin B$
5. $\cos(A - B) = \cos A \cos B + \sin A \sin B$
6. $2 \cos A \cos B = \cos(A + B) + \cos(A - B)$
7. $\sin 2A = 2 \sin A \cos A$
8. $\cos 2A = \cos^2 A - \sin^2 A$

Degrees	0°	30°	45°	60°	90°
$\sin \theta$	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
$\cos \theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
$\tan \theta$	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	