UNIVERSITY OF SWAZILAND

FINAL EXAMINATIONS 2007/8

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) Use synthetic division to find the quotient and remainder when $-x^4 + 5x^2 - 3x^3$ is divided by $x + 3$. [6 marks]

   (b) The polynomial $Ax^3 + 3x^2 + Bx - 12$ has $(x + 3)$ as a factor. When the polynomial is divided by $x + 1$ the remainder is -6. Find the values of A and B. [6 marks]

   (c) Find all the real roots of the polynomial

   $$x^4 - x^3 - 19x^2 + 49x - 30 = 0$$ [8 marks]

QUESTION 2

2. (a) Zanele wants to buy a new computer in three years' time that will cost E5000.

      (i) How much should he deposit now, at 5% interest compounded annually to give the required E5000 in three years? [3 marks]

      (ii) If he only has E4000 available to deposit now, what annual interest rate is required for it to increase to E5000 in three years? [4 marks]

   (b) Find the annual interest rate required to double a certain amount of money if the interest is compounded monthly for 10 years. [4 marks]

   (c) How many years will be needed for E5000 to increase to E25000 at 5% interest compounded continuously? [5 marks]

   (d) Solve the following equation

   $$\log(y + 1) = \log(y - 7) + \log 4$$

   [4 marks]

QUESTION 3

3. (a) Prove the trigonometric identity

$$\csc 2x - \cot 2x = \tan x$$

[4 marks]

(b) Solve the trigonometric equation

$$\cos 2x + \sin x = 0$$

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

(c) Convert the decimal 2.7121212 into a common fraction [5 marks]

(d) Find the sum of the following progressions

$$2 + 5 + 8 + 11 + \ldots\ldots + 1001$$

[5 marks]

QUESTION 4

4. (a) Find the 15th term in the expansion of $\left(2x^2 - \frac{1}{2x}\right)^{21}$ [6 marks]

(b) Find the term involving x^{-9} in the expansion of $\left(2\sqrt{x} - \frac{1}{2x}\right)^{18}$. [7 marks]

(c) Write out the first four terms in the expansion of $\frac{1}{\sqrt{1-x}}$ and use this expansion to estimate $\frac{1}{\sqrt{0.99}}$ correct to four significant figures. [7 marks]

QUESTION 5

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

$$\begin{aligned} 2x + 3y + z &= 2 \\ -x + 2y + 3z &= -1 \\ -3x - 3y + z &= 0 \end{aligned}$$

[14 marks]

QUESTION 6

6. (a) Write the equation of the circle with centre (2,-7) and which passes through the point (-2,-4) [4 marks]

(b) Find the centre and the radius of the circle given by $x^2+y^2+3x-5y-\frac{1}{2} = 0$ [6 marks]

(c) Find the equation of s straight line passing through the intersection of $3x - y = 9$ and $x + 2y = -4$, and is perpendicular to $3 = 2y + 8x$ [6 marks]

(d) Find an equation of the line parallel to the line $y = -2x + 3$ and which passes through the point (2,5). [4 marks]

QUESTION 7

7. (a) Express the following expressions in the complex form $a + bi$

(i) $(2 - 3i)(1 + 3i)$ [4 marks]

(ii) $\dfrac{5 - 2i}{2 - 3i}$ [4 marks]

(iii) $\sqrt{2}(\cos 225 + i \sin 225)$ [4 marks]

(b) Solve the quadratic equation

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

[8 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^o	30^o	45^o	60^o	90^o
$\sin\theta$	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	$\sqrt{3}$	