UNIVERSITY OF SWAZILAND

FINAL EXAMINATIONS 2006

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 the synthetic method to divide $x^5 + 3x^3 - 7x^2 - 8x + 1$ by $x + 2$ [5 marks]

   (b) Find the values of a and b if $x - 4$ and $x + 3$ are both factors of $x^3 + ax^2 + bx + 4$.   [6 marks]

   (c) Find all the rational roots of the polynomial $x^3 - 2x^2 - 13x - 10 = 0$ [9 marks]

QUESTION 2

2. (a) Solve the following equations for x

      (i) $\log_2(x^2 - 1) - \log_2(x - 2) = 3$,   [5 marks]

      (ii) $3^{2x+1} = 5^{x+1}$.   [5 marks]

   (b) How long will it take for R10 000 to grow to R25 000 at 5% compounded continuously?   [5 marks]

   (c) At what rate per annum compound interest will R4000.00 grow to R4315.14 in 3 years if the interest is compounded annually?   [5 marks]

3. (a) Prove the trigonometric identity

$$\frac{1}{1-\sin A} + \frac{1}{1+\sin A} = \frac{2}{\cos^2 A}.$$

[4 marks]

(b) Solve the trigonometric equation $\sin^2 y + 2\cos y = 2$, giving all solutions between $0°$ and $360°$. [6 marks]

(c) Convert the decimal $1.27272727\cdots$ into a common fraction. [5 marks]

(d) If the 8th term of a geometric progression is 243 and the 5th term is 9, find the first three terms of the geometric progression. [5 marks]

QUESTION 4

4. (a) Find the 22nd term in the expansion of $(x + \frac{1}{x})^{25}$. [6 marks]

(b) 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]

(c) Use mathematical induction to prove the formula

$$\frac{1}{1\cdot 2} + \frac{1}{2\cdot 3} + \frac{1}{3\cdot 4} + \ldots + \frac{1}{n\cdot(n+1)} = \frac{n}{n+1}.$$

[7 marks]

5. (a) Solve the following equation for x

$$\begin{vmatrix} -2 & 0 & 1 \\ -1 & 3 & x \\ 5 & -2 & 0 \end{vmatrix} = 3.$$

[6]

(b) use Cramer's rule to solve the system

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

[14 marks]

QUESTION 6

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

(b) Find the centre and radius of a circle defined by the equation $x^2 + y^2 + 6x - 4y - 3 = 0$.   [7 marks]

(c) Find the equation of the circle which passes through the points $(0, 0)$, $(3, 1)$, and $(3, 9)$.   [7 marks]

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

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

   (ii) $\dfrac{9 - 2i}{4 + 3i}$ [6 marks]

   (iii) $\sqrt{2}(\cos 135 + i\sin 135)$ [4 marks]

   (b) Write the complex number $z = -3\sqrt{3} + 3i$ in mod-arg form.   [6 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	$\sqrt{3}$	