UNIVERSITY OF SWAZILAND

SUPPLEMENTARY EXAMINATIONS 2009

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 long division method to find the quotient and remainder when $3x^3 + 2x^2 + x - 5$ is divided by $x + 1$. [6 marks]

   (b) When the polynomial $x^4 + ax^3 + 11x^2 + bx = 12$ is divided by $(x + 2)$ the remainder is 6. Given that $(x + 4)$ is a factor of the polynomial, find the values of a and b. [7 marks]

   (c) Find all the real roots of the polynomial

   $$x^4 + 9x^3 + 21x^2 - x - 30 = 0$$ [7 marks]

QUESTION 2

2. (a) Solve the following equations for x

   (i) $\log_2 x + \log_2(x - 7) = 3$ [5 marks]

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

   (b) Sipho wants to buy a new computer after three years that will cost E5000. How much should he deposit now, at 6% interest compounded monthly to give the required E5000 in 3 years? [5 marks]

   (c) Find the time required to treble a certain amount compounded continuously at 12% interest. [5 marks]

QUESTION 3

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

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

[6 marks]

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

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

[14 marks]

QUESTION 4

4. (a) Use the general formula for the rth term to find the coefficient of x^6 in the binomial expansion of

$$\left(1 + x^2\right)^8$$

[5 marks]

(b) Write out the first four terms in the expansion of $(1 + x)^{-2}$. [5 marks]

(c) Use Cramer's rule to solve the following system of equations [10 marks]

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

QUESTION 5

5. (a) 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]

   (b) Find the 20th term of the geometric progression 2, 10, 50, 250,.... [5 marks]

   (c) Find three numbers in arithmetic progression such that their sum is 15 and their product is 80. [5 marks]

   (d) Convert 0.818181 into an equivalent common fraction [5 marks]

QUESTION 6

6. (a) Find the equation of a straight line passing through the intersection of $3x - y = 9$ and $x + 2y = -4$, **parallel** to $3 = 4y + 8x$ [10 marks]

   (b) Find the centre and radius of a circle defined by the equation

$$x^2 - 6x + y^2 + 10y + 25 = 0$$

[10 marks]

QUESTION 7

7. (a) Solve the complex quadratic equation

$$z^2 - (3 - i)z + 4 = 0$$

and express you answer in the form $x + iy$

[7 marks]

(b) Evaluate $\dfrac{(1 + i)(2 + 3i)}{1 - i}$ and write the solution in the form $a + bi$ [4 marks]

(c) Prove by mathematical induction that the following formula

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

is valid for all positive integers.

[9 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	$\sqrt{3}$	