UNIVERSITY OF SWAZILAND

SUPPLEMENTARY EXAMINATIONS 2005

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

TITLE OF PAPER   :   INTRODUCTORY MATHEMATICS FOR BUSINESS

COURSE NUMBER   :   MS 101 AND IDE MS100-1

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. Solve the following equations for the unknown variables

    (a) $2\sin^2 x + 3\cos x - 3 = 0$ $(0^o \leq x \leq 360^o)$ [5 marks]

    (b) $x^3 + 6x^2 - x - 30 = 0$ [5 marks]

    (c) $3^x = 81$ [5 marks]

    (d) $\log x = \log(x + 3) = 1$ [5 marks]

QUESTION 2

2. (a) Find the sum of the first 100 odd numbers.   [5 marks]

    (b) Find a fraction representation of $1.212121\ldots$ [5 marks]

    (c) If the 8th term of a geometric series is 243 and the
5th term is 9, find the 3rd term.   [5 marks]

    (d) A parent places in a savings bank E25 on his son's first
birthday, E50 on his second, E75 on his third and so on,
increasing the amount by E25 on each birthday. How much will
be saved up (apart from any accrued interest) when the boy
reaches his 16th birthday if the final amount is added on
this day?   [5 marks]

QUESTION 3

3. (a) Solve the following trigonometric equation giving all solutions for x between 0° and 360°

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

[5 marks]

(b) Prove the following trigonometric identities

    i. $\tan x + \cot x = 2 \csc 2x$ [4 marks]

    ii. $\csc 2x - \cot 2x = \tan x$ [4 marks]

(c) Without using calculators, find $\sin 105^o$.   [3 marks]

(d) Given that $\sin \theta = \frac{2}{5}$ and that θ is in the 2nd quadrant, find $\tan \theta$ and $\sin 2\theta$.   [4 marks]

QUESTION 4

4. (a) Find the term containing x^{15} in the expansion of $\left(x^5 - \dfrac{2}{x^2}\right)^{10}$ [7 marks]

(b) Expand $(1 + x)^{-3}$ to four terms then use this expansion to approximate $(1.03)^{-3}$ correct to four decimal places. [7 marks]

(c) Use Mathematical Induction to prove that the following formula is valid for all positive integers.

$$2 + 4 + 6 + \cdots + 2n = n(n + 1)$$

[6 marks]

QUESTION 5

5. (a) Assuming an inflation rate of 5% compounded annually, how
   long will it take for prices to double? [5 marks]

   (b) Sphiwe wants to open a Saloon. How much must she deposit now
   at 8% interest compounded quarterly to have E20 000 at the end
   of 4 years. [5 marks]

   (c) Find the interest rate needed for E6 000 to grow to E8 000 in
   3 years if the interest is compounded monthly. [5 marks]

   (d) How long will it take for E7200 to grow to E39 600 at an interest
   rate of 4.5% if the interest is compounded continuously?

   [5 marks]

QUESTION 6

6. (a) Calculate $A^T B$ if the matrices A and B are given by [6 marks]

$$A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \\ 7 & 8 \end{pmatrix} \quad , \quad B = \begin{pmatrix} 1 & 3 \\ -1 & 4 \\ 2 & 6 \\ 3 & 2 \end{pmatrix}$$

   (b) Solve the following system of equations using Cramer's rule. [14 marks]

$$\begin{aligned} 2x + 4y + 6z &= 18 \\ 4x + 5y + 6z &= 24 \\ 3x + y - 2z &= 4 \end{aligned}$$

QUESTION 7

7. (a) Find the equation of a circle passing through the point (-2,-4) and with centre located at (2,-7). [4 marks]

    (b) Find the centre and radius of a circle whose equation is

    $$x^2 + y^2 + 3x - 5y - \frac{1}{2} = 0$$

    [4 marks]

    (c) Find the equation for the line with slope of -2 which passes through the intersection of $-3y + x = 4$ and $5y + 3 = -2x$ [4 marks]

    (d) Evaluate the complex number $\sqrt{8 - 6i}$ and express your answer in the form $a + ib$ where both a and b are real number. [4 marks]

    (e) Express the complex number $-1 - \sqrt{3}i$ in mod-arg form. [4 marks]

END OF EXAMINATION

Useful Formulas

The general rth term of a Binomial expansion of

$$(a+b)^n$$

is given by

$$C(n, r-1)a^{n-r+1}b^{r-1}$$

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. $\cos 2A = \cos^2 A - \sin^2 A$

9. $\cos 2A = 2\cos^2 A - 1$

10. $\cos 2A = 1 - 2\sin^2 A$

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	$\sqrt{3}$	