University of Swaziland

Supplementary Examination, 2007

DCom I, Bass I, BEd com I

Title of Paper : Introductory Mathematics for Business

Course Number : MS101/IDE-MS101

Time Allowed : Three (3) hours

Instructions :

1. This paper consists of SEVEN questions.

2. Each question is worth 20%.

3. Answer ANY FIVE questions.

4. Show all your working.

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

Question 1

(a) Given the matrices

$$A = \begin{pmatrix} -1 & 0 & -2 \end{pmatrix}, \; B = \begin{pmatrix} 1 & -1 \\ 0 & 2 \end{pmatrix}, \; C = \begin{pmatrix} -2 & 1 \\ 4 & 3 \end{pmatrix}, \; D = \begin{pmatrix} 1 & 3 \\ -2 & 0 \\ 0 & 2 \end{pmatrix}.$$

Perform the following operations where possible.   [10 marks]

$$2B + C^T, \; AD, \; AB, \; A - B, \; DC, \; DA.$$

If an operation is impossible, clearly state so and give the reason why.

(b) Consider the complex numbers $z_1 = -5 + 12i$ and $z_2 = 2 - 5i$. Compute

$$z_1 - z_2, \; z_1 z_2, \; |z_1|, \; \frac{z_2}{z_1},$$

expressing your complex answers in the form $a + ib$.   [10 marks]

Question 2

(a) Expand $\left(x^2 - \frac{2}{x}\right)^5$ and simplify term by term.   [10 marks]

(b) Solve for x given $\log_2(x^2 + 1) = 1$.   [4 marks]

(c) Consider the sequence of numbers $10, 7, 4, \cdots$.

(i) Find the 50th term of the sequence.   [2 marks]

(ii) Find the sum of the first 20 terms.   [4 marks]

Question 3

(a) Given

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 1 & 1 & 2 \\ 0 & 1 & 2 \end{pmatrix}, \quad A = \begin{pmatrix} 0 & 1 & -1 \\ 2 & -2 & -1 \\ -1 & 1 & 1 \end{pmatrix}.$$

Compute AB and BA.   [10 marks]

(b) Hence, or otherwise, solve the linear system   [10 marks]

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

Question 4

(a) In a Geometric Progression, the sum of the second and third terms is 6, while that of the third and fourth terms is -12. Find the 20th term. [10 marks]

(b) If $x = -3$ is a root of $P(x) = Ax^3 + 3x^2 + Bx - 12$ and $P(x)$ leaves a remainder of -6 when divided by $x + 1$, find the values of A and B. [10 marks]

Question 5

(a) Expand $\left(1 - i\sqrt{3}\right)^8$ and express in the form $a + ib$. [10 marks]

(b) Find the first four terms of the binomial expansion of $(1 - x^2)^{-2}$. [10 marks]

Question 6

(a) Prove the identity [10 marks]

$$\frac{\cos \alpha}{1 - \tan \alpha} + \frac{\sin \alpha}{1 - \cot \alpha} = \cos \alpha + \sin \alpha.$$

(b) Find all solutions of $x^4 - 5x^2 + 4 = 0$. [10 marks]

Question 7

(a) Prove by mathematical induction [12 marks]

$$1 + 5 + 9 + \cdots + (4n - 3) = n(2n - 1).$$

(b) Consider the line ℓ specified by $3x - 2y - 4 = 0$.

(i) Find the y-intercept of ℓ. [2 marks]

(ii) Find the slope of ℓ. [2 marks]

(iii) Find the equation of another line perpendicular to ℓ and passing through the point $(-1, 2)$. [4 marks]

.... END OF PAPER ....