UNIVERSITY OF SWAZILAND

SUPPLEMENTARY EXAMINATION, JULY 2012

B.A.S.S. I /B.Comm I, D.COM I (IDE)

TITLE OF PAPER	:	CALCULUS FOR BUSINESS AND SOCIAL SCIENCE
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
SPECIAL REQUIREMENTS	:	NONE

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

Question 1

(a) Use the long division method to find the quotient and remainder when $P(x) = 20x^3 + 21x + 18x^2 + 40$ is divided by $D(x) = 5x + 7$ [7]

(b) Find all the real roots of the polynomial $x^4 - x^3 - 19x^2 + 49x - 30$. [8]

(c) The expression $ax^3 + bx + 2$ has $x + 2$ as a factor. When the expression is divided by $x - 1$ the remainder is 4. Find the values of a and b. [5]

Question 2

(a) Calculate $(A - B)C^T$ if the matrices A, B and C are given by

$$A = \begin{bmatrix} 1 & -2 \\ 4 & 4 \\ 6 & 3 \\ 3 & 1 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & 5 \\ -2 & -4 \\ 1 & 3 \\ 3 & -1 \end{bmatrix}, \quad C = \begin{bmatrix} 0 & 1 \\ 2 & 1 \\ 1 & 0 \\ 3 & 2 \end{bmatrix}.$$

[7]

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

$$\begin{aligned} 2x - y + 2z &= 2 \\ x + 10y - 3z &= 5 \\ -x + y + z &= -3. \end{aligned}$$

[13]

Question 3

(a) Write the first four terms of the binomial expansion $\frac{1}{\sqrt{1+2x}}$. [5]

(b) Using the result in $3(a)$, find the value of $\frac{1}{\sqrt{1.02}}$ correct to five significant figures. [4]

(c) Find the term that involves x^8 in the expansion of $(x^2 - \frac{1}{x})^7$. [6]

(d) Expand $(x + 2y)^4$ using the Binomial theorem. [5]

Question 4

(a) Solve for x in each of the following equations

(i) $\log_x \frac{1}{32} = 5$. [5]

(ii) $\log_3(x + 12) - \log_3(x - 3) = \log_3 6$. [5]

(b) Suppose that you deposit $E8000$ on your $30th$ birthday. What rate r compounded semi-annually must your deposit earn in order to grow to 1 million Emalangeni by your $70th$ birthday. [5]

(c) How much money will grow to $E1200$ in 5 years at 12% compounded continuously. [5]

Question 5

(a) Find the first two terms of the geometric progression whose $3rd$ term is $\frac{25}{4}$ and $7th$ term is $\frac{4}{25}$. [5]

(b) The sum of n terms of the series $-2, 2, 6, ...$ is 160. Find n. [5]

(c) Find the sum of the infinite geometric progression $\frac{3}{2}, 1, \frac{2}{3}, ...$ [5]

(d) Convert the repeating decimal 0.52181818... into and equivalent common fraction. [5]

Question 6

(a) Solve the following trigonometric equation

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

giving all solutions between 0° and 360°. [5]

(b) Prove that

$$\frac{\csc\theta}{\csc\theta - \sin\theta} = \sec^2\theta.$$

[5]

(c) Using mathematical induction prove that

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

for all positive integers n. [10]

Question 7

(a) Find the equations of a straight line passing through the intersection of $3x - y = 9$ and $x + 2y = -4$ perpendicular to $3 = 4y + 8x$. [5]

(b) Find the centre and radius of the circle

$$7x^2 + 7y^2 + 14x - 56y - 25 = 0.$$

[6]

(c) Given the points $A = (6, 0)$ and $B = (8, 6)$. Find the equation of a circle with centre A and passing through the point B. **[5]**

(d) Write the complex number $3(\cos 135 + i \sin 135)$ in cartesian form $x + iy$. **[4]**

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

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

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

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	$\sqrt{3}$	