



**FACULTY OF SCIENCE**

<b>SM</b>	
<b>EM</b>	
<b>FM</b>	

**DEPARTMENT OF MATHEMATICS AND APPLIED MATHEMATICS  
NATIONAL DIPLOMA IN EXTENDED ANALYTICAL CHEMISTRY**

**MODULE            MATCXB1/MAT1YE2**

**CAMPUS           DFC**

**MAIN EXAMINATION**

**DATE:    16/11/2019**

**SESSION: 8:30—10:30**

**ASSESSOR:**

**MR EZ MORAPELI**

**INTERNAL MODERATOR:**

**MR MP SELOANE**

**DURATION:**

**2 HOURS**

**MARKS:**

**60**

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**SURNAME AND INITIALS:** \_\_\_\_\_

**STUDENT NUMBER:** \_\_\_\_\_

**CONTACT NO:** \_\_\_\_\_

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**NUMBER OF PAGES    : 11 (VERIFY THAT YOUR PAPER HAS ALL THE PAGES)**

**INSTRUCTIONS    : ANSWER ALL THE QUESTIONS IN THE SPACES PROVIDED  
                          : USE A PEN (BLUE OR BLACK) FOR WRITING AND DRAWING. NO PENCIL  
                          : NO PAGE FROM THIS PAPER SHOULD BE REMOVED**

**REQUIREMENTS   : INFORMATION BOOKLET PROVIDED BY THE INVIGILATOR(S)  
                          : NON-PROGRAMMABLE SCIENTIFIC CALCULATOR**

**SECTION A (10)****INSTRUCTIONS:**

USE THE TABLE BELOW TO **MARK THE LETTER (X)** CORRESPONDING TO THE CORRECT ANSWER. DO YOUR ROUGH WORK ON THE BLANK PAGES.

1. If  $z_1 = 2 + j$  and  $z_2 = 3j$ , then  $z_1 - \overline{z_2}$  is equal to:
 

A $2,83e^{-45j}$	B $4,47e^{1,11j}$
C $4,47e^{63,43j}$	D $2,83e^{-0,79j}$
2. The value of  $\lim_{x \rightarrow 0} \frac{\sin x}{x}$  is equal to:
 

A $-1$	B $0$
C $1$	D Undefined
3. If  $y = e^x$ , then  $\frac{d^2 y}{dx^2}$  is equal to:
 

A $e^x$	B $e^x + C$
C $e^x + Ce^x + B$	D $(x-1)e^{x-1}$
4.  $\int x\sqrt{1-x^2} dx$  is equal to:
 

A $\frac{\sqrt{(1-x)^3}}{3} + C$	B $-\frac{2}{3}(1-x^2)^{\frac{3}{2}} + C$
C $\frac{2}{3}(1-x^2)^{\frac{3}{2}} + C$	D $-\frac{\sqrt{(1-x)^3}}{3} + C$
5. If the velocity of the body is  $v(t) = 3t^2 + 4$  and the displacement after two seconds is  $s(2) = 10$ , then  $s(t)$  is equal to:
 

A $t^3 + 4t + 10$	B $12$
C $t^3 + 4t - 16$	D $t^3 + 4t - 6$

1.	A	B	C	D
2.	A	B	C	D
3.	A	B	C	D
4.	A	B	C	D
5.	A	B	C	D

[10]

**SECTION B (12)****INSTRUCTIONS:**

**GIVE ONLY THE FINAL SIMPLIFIED ANSWER (CORRECT TO TWO DECIMAL PLACES WHERE APPLICABLE) IN THE SPACE PROVIDED. DO YOUR ROUGH WORK ON THE BLANK PAGES.**

**USE A PEN (BLUE OR BLACK) FOR WRITING AND DRAWING. ANYTHING IN PENCIL WILL NOT BE MARKED**

6. Evaluate the following (Answer in rectangular form):

$$\left\{ 2(\cos(0,45) - j \sin(0,45)) \right\} - e^j \quad \boxed{\phantom{000000}} \quad (2)$$

7. Find the following in their simplest forms:

7.1  $f'(x)$  if  $f(x) = x \sin x$   $\boxed{\phantom{000000}}$  (2)

7.2  $f'(0,5)$  if  $f(x) = 3x^2 - 1$   $\boxed{\phantom{000000}}$  (2)

7.3  $e^{1+j} - \sqrt{-4}$  (Answer in rectangular form)  $\boxed{\phantom{000000}}$  (2)

8. Evaluate:

8.1  $\int 2b^2 \sqrt{x^3 - 4} \, db$   $\boxed{\phantom{000000}}$  (2)

8.2  $\int 2^x \sin(2^x) \, dx$   $\boxed{\phantom{000000}}$  (2)

[12]

## INSTRUCTIONS

9. Use De Moivre's theorem to evaluate:

(Answer in exponential form).

(4)

[illegible]

10. Determine **the roots** of the equation  $z = \sqrt{3+j}$  and express your answers in rectangular form. (4)

[illegible]

[illegible]



14. Given:  $y = x^3 - 12x^2 + 36x$ .

14.1 Determine all intercepts.

(3)


14.2 Determine the critical points.


(3)


14.3 Determine the inflection point.

(2)




14.4 Use 14.1 to 14.2 above to sketch the graph  $y = x^3 - 12x^2 + 36x$  (3)



15. Determine the following integrals:

$$15.1 \quad \int \sqrt{3x^5} \, dx \quad (2)$$

[illegible]

$$15.2 \quad \int \sqrt{1 - \sin^2 x} \, dx \quad (3)$$


$$15.3 \quad \int_2^3 \frac{1+x}{x^2+2x-6} \, dx \quad (3)$$


[39]

AVAILABLE MARKS: 61

**USE THIS SPACE TO RE-DO ANY QUESTION YOU MAY HAVE CANCELLED**

[illegible]