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FACULTY OF SCIENCE

			S AND APPLIED MATHEMATICS DED ANALYTICAL CHEMISTRY
	MODULE	MATCXB1/MAT1YE2	
	CAMPUS	DFC MAIN EXAN	IINATION
DATE:	16/11/2019		SESSION: 8:30—10:30
ASSES	SOR:		MR EZ MORAPELI
INTERN	IAL MODERATO	R:	MR MP SELOANE
DURAT	ION:		2 HOURS
MARKS	:		60
SURNA	ME AND INITIAL	_S:	
STUDE	NT NUMBER:		
CONTA	CT NO:		
NUMBE	R OF PAGES	: 11 (VERIFY THAT YOU	R PAPER HAS ALL THE PAGES)

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

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

SECTION A (10)

USE THE TABLE BELOW TO <u>MARK THE LETTER</u> (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:		
	А	$2,83e^{-45j}$		$4,47e^{1,11j}$
	С	$4,47e^{63,43j}$	D	$2,83e^{-0,79j}$
2.	The	value of $\lim_{x\to 0} \frac{\sin x}{x}$ is equal to:		
	А	-1	В	0
	С	1	D	Undefined
3.	lf y∍	$=e^x$, then $\frac{d^2y}{dx^2}$ is equal to:		
	А	e^{x}	В	$e^{x}+C$
	С	$e^x + Ce^x + B$	D	$e^{x} + C$ $(x-1)e^{x-1}$
4.	$\int x \sqrt{1-x}$	$\sqrt{1-x^2} dx$ is equal to:		
	A	$\frac{\sqrt{\left(1-x\right)^3}}{3} + C$	В	$-\frac{2}{3}(1-x^2)^{\frac{3}{2}}+C$
	С	$\frac{2}{3} \left(1 - x^2\right)^{\frac{3}{2}} + C$	D	$-\frac{\sqrt{\left(1-x\right)^3}}{3}+C$

If the velocity of the body is $v(t) = 3t^2 + 4$ and the displacement after two seconds 5. is s(2) = 10, then s(t) is equal to:

А	$t^3 + 4t + 10$	В	12
С	$t^3 + 4t - 16$	D	$t^3 + 4t - 6$

1.	Α	В	С	D
2.	A	В	С	D
3.	A	В	С	D
4.	Α	В	С	D
5.	Α	В	С	D

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

	aluate the following (Answer in rectangular form): $\left(\cos(0,45) - j\sin(0,45)\right) - e^{j}$	(2)
7. Fir	nd the following in their simplest forms:	
7.1	$f'(x)$ if $f(x) = x \sin x$	(2)
7.2	$f'(0,5)$ if $f(x) = 3x^2 - 1$	(2)
7.3	$e^{1+j} - \sqrt{-4}$ (Answer in rectangular form)	(2)
8. Eva	aluate:	
8.1	$\int 2b^2 \sqrt{x^3 - 4} \ db$	(2)
8.2	$\int 2^x \sin\left(2^x\right) dx$	(2)

[12]

[10]

SECTION C (41)

INSTRUCTIONS

SHOW ALL THE IMPORTANT STEPS TAKEN AND GIVE YOUR FINAL ANSWERS CORRECT TO TWO DECIMAL PLACES WHERE APPLICABLE. USE PAGE 11 TO RE-DO ANY QUESTION YOU MAY HAVE CANCELLED.

9. Use De Moivre's theorem to evaluate:

 $3, 2\left(\cos 20^\circ + j\sin 20^\circ\right)^3$

 $1,45(\cos 1, 2 - j\sin 1, 2)$

(Answer in exponential form).

(4)

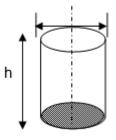
10. Determine **the roots** of the equation $z = \sqrt{3+j}$ and express your answers in rectangular form.

(4)

11. Find
$$\frac{dy}{dx}$$
, if $y = \frac{\sqrt{1-x}}{x^2}$. (4)

12. Find f'(x) if $f(x) = \sqrt{\cos x - x}$

13. The sum of the radius and the height of a cylindrical can shown below is 10 cm.



What dimensions will result in maximum volume?

(3)

(5)

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

14.1 Determine all intercepts.

14.2 Determine the critical points.

(3)

14.3 Determine the inflection point.

(2)

(3)

14.4 Use 14.1 to14.2 above to sketch the graph $y = x^3 - 12x^2 + 36x$ (3)

15. Determine the following integrals:

$$15.1 \qquad \int \sqrt{3x^5} \, dx$$

(2)

$$15.2 \int \sqrt{1-\sin^2 x} \, dx$$

$$15.3 \int_{2}^{3} \frac{1+x}{x^{2}+2x-6} dx \tag{3}$$

[39]

AVAILABLE MARKS: 61

(3)

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

