UNIVERSITY OF JOHANNESBURG

FACULTY OF SCIENCE
FAKULTEIT NATUURWETENSKAPPE

DEPARTMENT OF MATHEMATICS /DEPARTEMENT WISKUNDE

MODULE **FOMED01**
FOUNDATION MATHEMATICS
CIVIL ENGINEERING EXTENDED, BEng Tech
ELECTRICAL ENGINEERING EXTENDED, BEng Tech
INDUSTRIAL ENGINEERING EXTENDED, BEng Tech
MECHANICAL ENGINEERING EXTENDED, BEng Tech

CAMPUS **DFC**
KAMPUS DFK

EXAMINATION **NOVEMBER 2019**
EKSAMEN

DATE **19 November 2019** **SESSION** **08h30**
DATUM SESSIE

ASSESSOR(S) MR NB KONE

INTERNAL MODERATOR MR S MATLALA
INTERNE MODERATOR

DURATION 3 HOURS MARKS 100
TYDSDUUR **3 UUR** **PUNTE** **100**

SURNAME AND INITIALS
VAN EN VOORLETTERS _____

STUDENT NUMBER
STUDENTENOMMER _____

CONTACT NR
KONTAK NO _____

LECTURER: _____

NUMBER OF PAGES: 19 PAGES
AANTAL BLADSYE: 19 BLADSYE

INSTRUCTIONS: ANSWER ALL THE QUESTIONS
INSTRUKSIES: BEANTWOORD AL DIE VRAE

REQUIREMENTS: SCIENTIFIC CALCULATOR

INSTRUCTIONS

1. By inserting your name and student number on this examination book you confirm that you are conversant with the examination regulations of the University.

2. All questions are compulsory. Candidates must use the spaces provided.

3. Rough work must be done in the blank pages.

4. Under no circumstances may a candidate retain this book, remove it from the examination room or remove pages from it.

5. This question paper consists of 19 pages and 3 Sections.

6. **DO NOT DETATCH ANY PAGE !!!**

WARNING

A candidate transgresses if he/she:

1. takes into the examination room without authorization, any book, document or object which may be of assistance to him/her in the examination and fails to deliver it to the invigilator at the commencement of the examination.

2. assists or attempt to assist another candidate, obtains assistance from another candidate, attracts the attention or attempts to attract the attention of another candidate.

For Office Use Only	Examiner	Moderator	Final
SEMESTER MARK			
EXAM MARK			
FINAL MARK			

SECTION A [20]

INSTRUCTIONS

USE THE TABLE ON PAGE 3 TO MARK THE LETTER (X) CORRESPONDING TO THE CORRECT ANSWER. DO YOUR ROUGH WORK ON THE BLANK PAGES OVERLEAF.

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1. What value can multiply with $\sqrt{3}$ for the answer to be a rational number?

   A. 3 B. $\sqrt{2}$ C. $\sqrt{6}$ D. $\sqrt{12}$

2. The complex number $\frac{3-\sqrt{-4}}{j} =$

   A. $2-3j$ B. $-2+3j$ C. $-2-3j$ D. $2+3j$

3. The value of hexadecimal number $A3$ as a decimal number is

   A. 136 B. 160 C. 163 D. 179

4. The inverse of the function $y=\sqrt{3-x}$ is

   A. $y=x^2+3$ B. $y=-x^2+3$ C. $y=3-\sqrt{x}$ D. $y=x^2-3$

5. If $2x-3$ is one factor of $8x^3-27$, then the other factor is

   A. $4x^2-6x+9$ B. $4x^2+6x+9$ C. $4x^2-6x-9$ D. $4x^2+12x+9$

6. The third term of the expansion $(2-5x)^5$ is

   A. $-2000x^2$ B. $2000x^2$ C. $-4000x^2$ D. $4000x^2$

7. $\operatorname{cosec} 30° - \tan^{-1}(1) =$

   A. -43 B. $-43°$ C. $1{,}215$ D. $2{,}785$

8. $\lim_{x\to 3}\frac{x^2-5x+6}{x-3} =$

   A. 1 B. 0 C. -1 D. ∞

9. If $\frac{d}{dx}(x^3 - 8) = 48$ then the value(s) of x is:

A. 0 B. -4 C. 4 D. ± 4

10. $\int \sqrt{x^2 - 4x + 4}\ dx =$

A. $\frac{1}{3}(x^2 - 4x + 4)^{\frac{3}{2}} + C$ B. $\frac{3}{4}(x^2 - 4x + 4)^{\frac{3}{2}} + C$

C. $\frac{x^2}{2} - 2x + C$ D. no answer

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
6.	A	B	C	D
7.	A	B	C	D
8.	A	B	C	D
9.	A	B	C	D
10.	A	B	C	D

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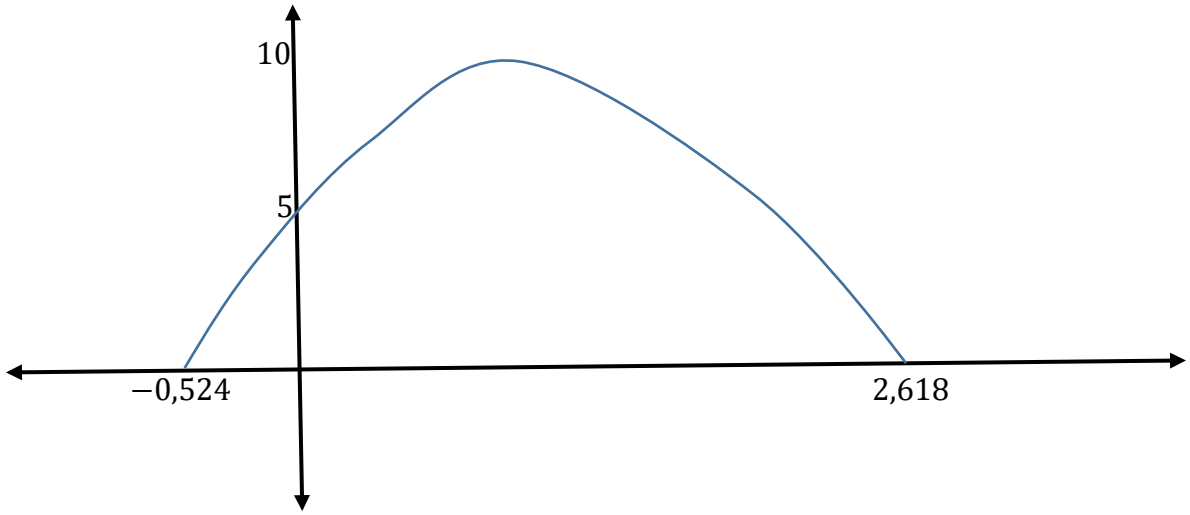
SECTION B [34]

PLEASE WRITE ONLY THE FINAL SIMPLIFIED ANSWER CORRECT TO TWO DECIMAL PLACES WHERE APPLICABLE ON THE SPACE PROVIDED, DO YOUR ROUGH WORK ON THE BLANK PAGES.

11. Please study the graph of $y = a\sin(x + \beta)$ below and then answer the questions that follow:



11.1. What is the amplitude of the graph? (2)

11.2. What is the period of the graph? (2)

11.3. Write down the value of β. (2)

12. Sketch each of the following graphs, showing **intercepts with axes** and any other important points:

12.1. $y = 2^{x-2}$ (3)

12.2. $x = y^2 - 4y - 5$ (4)

13. Write down the first three terms of the expansion $(3x + 2y)^6$ (3)

14. $\frac{\sqrt{1-\cos^2 x}}{\sin x} + \frac{\sqrt{1-\sin^2 x}}{\cos x} =$ (2)

15. Rewrite $\frac{2-j}{j^3}$ in the form of $a + bj$ (2)

16. For what value(s) of a will $x + 3$ be a factor of $3x^2 + ax + 6$? (2)

17. $\lim_{x \to \frac{17\pi}{4}} \tan x =$ (2)

18. If $f(x) = 3x^2 - 4x$, the $f'(3) =$ (2)

19. Determine $\frac{dy}{dx}$ if $y = \sqrt{2x - 1}$ (2)

20. The point of inflection of $f(x) = x^3 - 6x^2$ is (2)

21. $\int_0^2 (x+1)dx =$ (2)

22. $\int e^{2x}dx =$ (2)

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SECTION C [51]

PLEASE WRITE THE ANSWERS IN FULL, SHOWING ALL THE DETAILS IN THE SPACE PROVIDED. USE THE SPACE ON PAGE 19 TO REDO ANY ANSWER YOU MAY HAVE CANCELLED.

23. Solve for x:

23.1. $2 - \sqrt{x-1} = 2x$ (5)

23.2. $\ln x + \ln(x+1) = e^{\ln 6}$ (5)

24. Given $z_1 = 1 - j$ and $z_2 = j$, determine the value of $\frac{\bar{z}_1 - z_2}{z_1}$ in the form $a + bj$. (5)

25. Convert the binary number 1001101_2 into an octal number. (4)

26. Evaluate $\lim_{x \to 5} \frac{2-\sqrt{x-1}}{5-x}$ (5)

27. Differentiate the following equations with respect to x.

27.1. $f(x) = \sqrt{x} - \frac{4}{x}$ (3)

27.2. $y = \frac{x-2}{x+2}$ (3)

27.3. $y = \ln \frac{(x+3)e^{2x}}{\sqrt{x-1}}$ (4)

28. Integrate the following expressions:

28.1. $\int (x + 5)\, dx$ (2)

28.2. $\int \frac{x}{3x^2-4}\, dx$ (4)

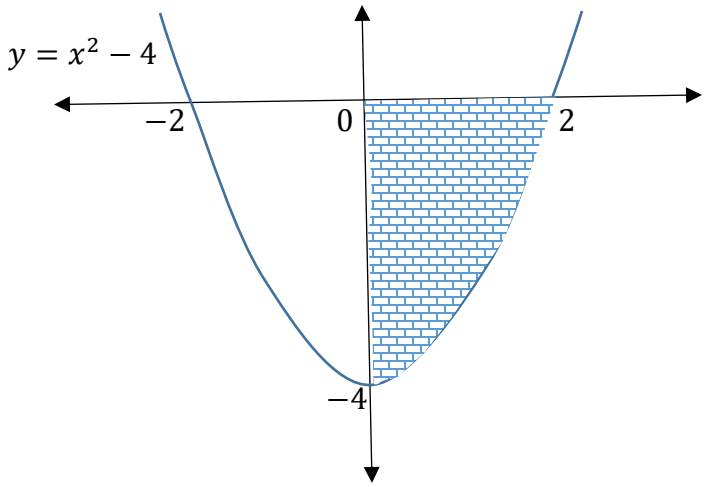
29. A velocity (in $m.s^{-1}$) of a car was measured by $v(t) = 2t + 5$, determine

29.1. The velocity after 2 seconds. (2)

29.2. The displacement between 1 and 4 seconds. (3)

29.3. The acceleration of the motion. (2)

30. Determine the shaded area (4)



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Available Marks: 105 Total Marks: 100

REDO ALL QUESTIONS YOU MAY HAVE CANCELLED, PLEASE NUMBER YOUR ANSWERS APPROPRIATELY.