



FACULTY OF SCIENCE

DEPARTMENT OF MATHEMATICS AND APPLIED MATHEMATICS
CONSTRUCTION ENGINEERING

MODULE: MATEBD1
CAMPUS: DFC
ASSESSMENT: SEMESTER 2, FINAL EXAM

DATE: 09 NOVEMBER 2019

TIME: 08:00-11:00

DURATION: 180 MINUTES

ASSESSOR:
MODERATOR:

DR SR HERBST
DR T PAEPAE

MARKS OBTAINED	120	%
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DURATION: 180 MINUTES

MARKS: 120 + 10 BONUS MARKS

INITIALS AND SURNAME: _____

STUDENT NUMBER: _____

CONTACT NUMBER: _____

INSTRUCTIONS: WRITE YOUR STUDENT NUMBER AND PARTICULARS IN THE SPACE PROVIDED
ANSWER ALL QUESTIONS IN THE ANSWER BOOKLET
USE ONLY A PEN FOR WRITING AND DRAWING (BLACK OR BLUE)

REQUIREMENTS: INFORMATION BOOKLET (AS ISSUED TO YOU IN THE TEST)
NON-PROGRAMMABLE SCIENTIFIC CALCULATOR

SECTION A: DIFFERENTIATION [55 MARKS]**INSTRUCTIONS**

**SHOW ONLY THE MOST IMPORTANT STEPS EXCEPT WHERE ASKED OTHERWISE.
PERFORM ROUGH CALCULATIONS ON BLANK PAPER.**

1. Calculate the derivative of the following functions, show full workings:

a. $y = \frac{1}{25}x^5 + 2 \cos 3x - 3 \ln(x^{\frac{1}{5}}) + \sinh(2x - 1)$

(5)

b. $f = \sin 3t \cosh(4 \sin 3t)$

(5)

c. $y = \sec \sqrt{x} - \cos(2x^4)$

(5)



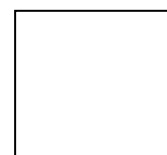
d. $g = \tanh \theta$

(Show full workings)

(5)

e. $y = e^{2 \sin^2 x} - \arctan \sqrt{x^2 - 1}$

(10)

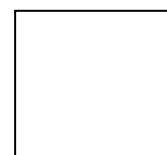


f. $y = \operatorname{arcsec} x + \arcsin e^{2x}$ (10)

2. Consider the two functions $x(t)$, $y(t)$ and determine the derivative $\frac{dy}{dx}$.

a. $x(t) = t - \sin t$, $y(t) = 1 - \cos t$ (3)

b. $x(t) = 2 \cos t + \cos 2t$, $y(t) = 2 \sin t - \sin 2t$. *Hint:* $\frac{1 - \cos t}{\sin t} = \tan \frac{t}{2}$. (7)



3. Find the rate of change $\frac{df}{dt}$, for the function $f = \sqrt{x^2 + y^2 + z^2}$. (5)

SECTION B: INTEGRATION [55 MARKS]

INSTRUCTIONS

SHOW ALL THE STEPS TAKEN AND GIVE YOUR FINAL ANSWERS CORRECT TO TWO DECIMAL PLACES WHERE APPLICABLE.

4. Compute the following integrals

a. $\int (3x^2 + \sin 2x - e^{-5x} + \frac{2}{x} - 4)dx$ (5)

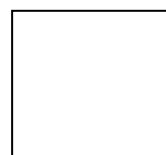


b. $\int (3x^2 - 1) \sin(x^3 - x) dx$

(5)

c. $\int_0^{\pi/4} \tan^2 t \, dt$

(5)



d. $\int_0^\pi \sin^3 \theta \cos^2 \theta \, d\theta$

(10)

e. $\int_{-1}^1 \frac{5}{(\theta^2 + \theta - 6)} \, d\theta$

(7)

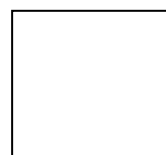


f. $\int_0^{0.5} -\frac{2}{\cos 2\theta} d\theta$

(8)

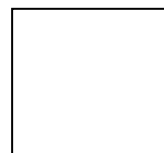
g. $\int_{-0.5}^{0.5} \frac{1}{1-x^4} dx$

(10)



h. $\int_0^{1.54} \frac{1}{1-\sin x} dx$

(5)



SECTION C: MATRICES [10 MARKS]**INSTRUCTIONS**

SHOW ALL THE STEPS TAKEN AND GIVE YOUR FINAL ANSWERS CORRECT TO TWO DECIMAL PLACES WHERE APPLICABLE.

1. Find the eigenvalues of the matrix $\begin{pmatrix} 1 & -2 \\ 3 & -5 \end{pmatrix}$ (5)

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[illegible]

(5)

[illegible]

Use this space if you want to redo any question(s). Please indicate clearly at the relevant question(s) that the solution is on this page.

[illegible]

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