Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2021/2022

COURSE NAME	:	CALCULUS
COURSE CODE	:	BWD 11003
PROGRAMME CODE	:	BWD
EXAMINATION DATE	:	JANUARY/FEBRUARY 2022
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWERS **ALL** QUESTIONS. 2. THIS FINAL EXAMINATION IS AN **ONLINE** ASSESSMENT AND CONDUCTED VIA **OPEN BOOK**

THIS QUESTION PAPER CONSISTS OF **THREE (3)** PAGES

Q1 (a) Find $\frac{dy}{dx}$ of:

(i) $y = \dfrac{e^2 - x}{\cos(2x)}$

(4 marks)

(ii) $y = (\sqrt{4x^2 + 1} - 5x)$

(5 marks)

(b) Given a function, $g(x) = \sin(3x) - e^{2x}$.

(i) Find $g'(x)$.

(4 marks)

(ii) Find $g''(0)$, solve for x.

(5 marks)

(c) Differentiate the following functions with respect to x.

(i) $x^3 + 5y^4 - 2 = 1$.

(4 marks)

(ii) $y = \frac{1}{x} - \sin(-2x)$.

(3 marks)

Q2 (a) Let $f(x) = x^4 - 4x^3 + 10$

(i) Find all critical points of $f(x)$.

(4 marks)

(ii) Determine whether the critical points are minimum, maximum or inflection point.

(4 marks)

(b) Fresh juice is being poured into and poured out from a container. The volume of the container is measured an hourly basis, starting at 0. The volume of fresh juice (litre) in the container can be modelled by the following formula

$$V(t) = 60 + 41t - 3t^2, \quad V(t) \geq 0$$

where $t \in \mathrm{T}$ is the time in hours, starting 0.

(i) Find the value of t when the container is empty.

(5 marks)

(ii) Find the rate at which the volume of fresh juice in the container changes when $t = 5$.

(4 marks)

(iii Find the value of t when the volume of the fresh juice in the container is at its maximum.

(4 marks)

(iv) Find the maximum volume of fresh juice in the container, correct to the nearest litre.

(4 marks)

Q3 Find and show the work for

(a) $\int_1^2 \frac{(x+3)(3x+2)}{x}\,dx.$

(4 marks)

(b) $\int_0^{\frac{\pi}{2}} (\sin(2x) - \cos x)\,dx.$

(6 marks)

(c) $\int_0^2 (3x^2 + 2x + 5)dx.$

(5 marks)

(d) $\int \frac{(3x+11)}{x^2-x-6}\,dx.$

(5 marks)

(e) $\int_0^1 \ln|x|\,dx.$

(5 marks)

Q4 (a) Evaluate by solving the work for

(i) $\int_0^1 xe^{-x}dx.$

(6 marks)

(ii) $\int_4^5 \frac{29-3x}{x^2-x-6}\,dx.$

(6 marks)

(b) Calculate the arc length of the curve $y = \frac{x^3}{12} + \frac{1}{x}$ from $x = 1$ and $x = 2$.

(6 marks)

(c) A storage tank is designed by rotating $y = x^2 + 1$; about the x- axis, y- axis, line $x = 2$, and revolves 180° where x and y are both measured in meters. Determine how many cubic meters the tank can hold.

(7 marks)

- END OF QUESTIONS –