Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2023/2024

COURSE NAME	:	FUNDAMENTALS OF MATHEMATICS FOR COMPUTER SCIENCE
COURSE CODE	:	BIC 10003
PROGRAMME CODE	:	BIS/BIP/BIW/BIM
EXAMINATION DATE	:	JULY 2024
DURATION	:	3 HOURS
INSTRUCTIONS	:	1. ANSWER ALL QUESTIONS 2. THIS FINAL EXAMINATION IS CONDUCTED VIA ☐ Open book ☒ Closed book 3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

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Q1 Differentiate the following expressions with respect to x.

(a) $y = 6x^{\frac{4}{3}} - 2x^{\frac{5}{2}}$

(4 marks)

(b) $y = \frac{x+x^2}{\sqrt{x}}$

(4 marks)

(c) $y = x\,(\sqrt{x} + x^{-4})$

(5 marks)

(d) $y = \frac{4+x}{2x^3}$

(6 marks)

(e) $y = \frac{(2+x)(2x-3)}{4x^5}$

(7 marks)

Q2 Solve the following applications of differentiation problems.

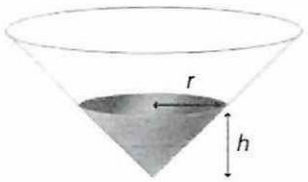
(a) The volume, V cm^3, of a soap bubble is modelled by the formula

$$V = (p - qt)^2, t \geq 0$$

Where p and q are positive constants, and t is the time in seconds, measured after a certain instant. When $t = 1$, the volume of a soap bubble is 9 cm^3, and at that instant, its volume decreases at 6 cm^3 per second. Determine the value of p and the value of q.

(8 marks)

(b) An upturned cone with semi-vertical angle 45^0 is being filled with water at a constant rate 30 cm^3 per second. [Hint the $V = 1/3\ \pi r^2 h$]



When the depth of the water is increasing to 60 cm^3, find the rate of

(i) the depth, h

(4 marks)

(ii) the radius, r

(3 marks)

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(iii) the area of the water surface, S

(4 marks)

Q3 Solve the following integrals.

(a) Find $\int \frac{2x}{x^2+1} dx$

(4 marks)

(b) Find $\int \frac{2x}{(4+3x^2)^2} dx$ by using the substitution $u = 4 + 3x^2$

(4 marks)

(c) Find $\int \frac{12x}{(1-x^2)^{1/2}} dx$ by using the substitution $u = 1 - x^2$

(4 marks)

(d) Proof $\int_0^{1/3} x\, e^{3x}\, dx = \frac{1}{9}$

(5 marks)

(e) Find $\int_0^2 (4x^2 - 5x + 7) dx$

(5 marks)

Q4 (a) Answer **Q4(a)(i)** to **Q4(a)(iii)** based on **Table Q4.1**.

Table Q4.1 Age of High Blood Pressure Patient

71	46	54	59	65	34	71	45	57	78
50	82	58	55	58	54	67	39	60	49
96	76	58	62	84	74	42	54	64	100
53	68	44	57	78	48	81	55	40	46
61	86	46	50	68	57	59	43	91	37
73	51	60	47	36	48				

(i) Construct a relative frequency table.

(10 marks)

(ii) Compute the mean, mode and median of the dataset.

(3 marks)

(iii) Compute the population variance and standard deviation.

(4 marks)

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(b) An integer is selected randomly from a set of integers {1,2,3,4,5,6,7,8,9,10,11,12}. Find the probability that the integer is;

(i) An even number or divisible by 4

(2 marks)

(ii) An even number and is not divisible by 4

(2 marks)

(iii) Not an even number and is not divisible by 4

(2 marks)

- END OF QUESTIONS -

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