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Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2022/2023**

COURSE NAME : FUNDAMENTALS OF MATHEMATICS
FOR COMPUTER SCIENCE

COURSE CODE : BIC 10003

PROGRAMME CODE : BIS / BIP / BIW / BIM

EXAMINATION DATE : JULY/AUGUST 2023

DURATION : 3 HOURS

INSTRUCTIONS

1. ANSWER ALL QUESTIONS.
2. THIS FINAL EXAMINATION IS CONDUCTED VIA **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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TERBUKA

Q1 Solve the following derivation.

(a) If $y = (6x + 10)$, find $\frac{dy}{dx}$. (4 marks)

(b) If $y = (x^2 - 3)^2$, find $\frac{dy}{dx}$. (4 marks)

(c) Differentiate $y = \sqrt{4 + 3\sqrt{x}}$. (4 marks)

(d) If $u = x^3 - 2x + 5$ and $y = u^{-1}$, find $\frac{dy}{dx}$ for $y = \frac{1}{x^3 - 2x + 5}$. (6 marks)

(e) If $u = (8x + 5)^{12}$, $v = (x^3 + 7)^{13}$ and $y = uv$, find $\frac{dy}{dx}$ for $y = (8x + 5)^{12}(x^3 + 7)^{13}$. (7 marks)

Q2 (a) The length of rope, l cm at t seconds is given by

$$l = \frac{1}{4}t^4 - 4t + 10$$

(i) Determine the time, t when the length, l of the rope increases at a rate of 4 cm s^{-1} . (5 marks)

(ii) the length, l of the rope decreases at a rate of 3 cm s^{-1} . (5 marks)

(b) The radius, r cm of a sphere at t seconds is given by

$$r = 4 + \frac{3}{2+t} + 2t^2$$

(i) Find the initial radius of a sphere. (5 marks)

(ii) Find the rate of change of r at $t = 3$. (5 marks)

(c) The area of ink blot at time t is $A \text{ cm}^2$ where $A = 3t^2 + t$. Determine the rate of change in the blot area when $t = 5$. (5 marks)

Q3 Calculate the following integrals.

(a) $\int (4x + 1) dx$ (4 marks)

(b) $\int (4x + 1)^2 dx$ (4 marks)

(c) $\int \frac{x+1}{x^2(x-1)} dx$ (5 marks)

(d) $\int \frac{2x}{x^2+1} dx$ (6 marks)

(e) $\int_0^2 (4x^2 - 5x + 7) dx$ (6 marks)

Q4 Table 1 shows the dataset on age (in years) of cancer patients.

Table 1: Age of cancer patients

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				

(a) Based on quantitative dataset above, construct a relative frequency table. (10 marks)

(b) Compute the mean, mode and median of the dataset. (9 marks)

(c) Compute the population variance and standard deviation. (6 marks)

- Q5** (a) A fair die is tossed once.
- (i) Find the probability distribution function for the elements in the sample space. (5 marks)
 - (ii) The probability distribution is a discrete or continuous probability distribution. (2 marks)
 - (iii) Find the mean and variance. (8 marks)
- (b) When a ball is selected from a box that contains a blue, a yellow, a red, a green and a black ball, where each element of the sample space $S = \{\text{blue, yellow, red, green, black}\}$ occurs with the probability 0.5. Find the probability distribution function of the coloured ball selected. (10 marks)

- END OF QUESTIONS -