

**UNIVERSITY COLLEGE TATI (UC TATI)****FINAL EXAMINATION QUESTION BOOKLET**

COURSE CODE	: BGE 1122
COURSE TITLE	: FUNDAMENTAL MATHEMATICS FOR COMPUTER SCIENCE
SEMESTER/SESSION	: 1-2023/2024
DURATION	: 3 HOURS

**Instructions:**

1. This booklet contains **6** questions in Section A, **3** questions in Section B and **2** questions in Section C. Answer **ALL** questions.
2. All answers should be written in answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise up your hands and ask the invigilator.

**DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO**

**THIS BOOKLET CONTAINS 6 PRINTED PAGES INCLUDING COVER PAGE**

**SECTION A (50 MARKS)**

**INSTRUCTION: ANSWER ALL QUESTIONS.**

**QUESTION 1**

Solve the following.

a)  $[(18 - 6) \div 4] + [72 - 12 \div 3 \times 3]$  (4 marks)

b)  $\left[ \left[ (45 + 90 \div 3 \times 6) \times 2 \right] \div \frac{1}{2} \right]$  (4 marks)

**QUESTION 2**

a) Express 152 as a product of prime factors. (2 marks)

b) Julie and Jack run a stall at a car boot sale and take a total of RM 180. They share the money in the ratio of 4:5. How much money does each receive? (3 marks)

c) Find the sum of arithmetic progression  $5+9+13+\dots$  to 20<sup>th</sup> terms. (3 marks)

**QUESTION 3**

a) Solve the following inequalities.

i.  $\frac{5x-1}{4} > 3x$  (2 marks)

ii.  $-5 \leq \frac{5-3x}{2} \leq 8$  (4 marks)

b) Solve  $(16^{x-1})(64^{2x}) = \frac{1}{256^{-x}}$  (4 marks)

**QUESTION 4**

Find the value of  $x$  and give your answer to 4 decimal places.

a)  $3^x = 7$  (3 marks)

b)  $\log_4(x-6) = -2$  (3 marks)

**QUESTION 5**

- a) Draw an undirected graph with multiple edges and loops based on the given information. (5 marks)

$$V = \{P, Q, R, S\}$$

$$E = \{(P, P), (P, Q), (P, S), (Q, S), (Q, S), (Q, R), (S, R), (R, R)\}$$

- b) Suppose a graph with five vertices of degree 1, 1, 4, 4, and 6. How many edges does the graph have? (2 marks)

**QUESTION 6**

The graph is shown in Figure 1 below.

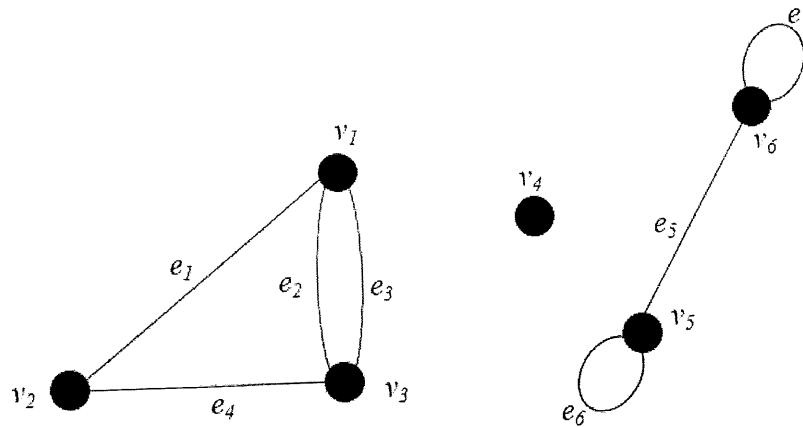


Figure 1

- a) Define the vertex sets and its edge set. (2 marks)
- b) List the isolated vertices. (1 mark)
- c) List the loops. (2 marks)
- d) List the parallel edges. (2 marks)
- e) List the vertices adjacent to  $v_1$ . (2 marks)
- f) Find all edges incident on  $v_2$ . (2 marks)

**SECTION B (30 MARKS)**

**INSTRUCTION: ANSWER ALL QUESTIONS.**

**QUESTION 1**

a) Solve the following logarithmic equation.

$$\log_5(4t+7) - \log_5 t = 2 \quad (6 \text{ marks})$$

b) Find the values of  $x$  which satisfy the equation of  $2^{2x} - 5(2^{x+1}) + 25 = 0$ .

(6 marks)

**QUESTION 2**

The sum of the first 6 terms of an arithmetic progression is 96. The sum of the first 10 terms is one-third of the sum of the first 20 terms. Calculate:

a) the first term.

(7 marks)

b) the 18<sup>th</sup> term.

(2 marks)

c) the sum of the first 5 terms.

(2 marks)

**QUESTION 3**

Consider the following undirected graph in Figure 2. Find:

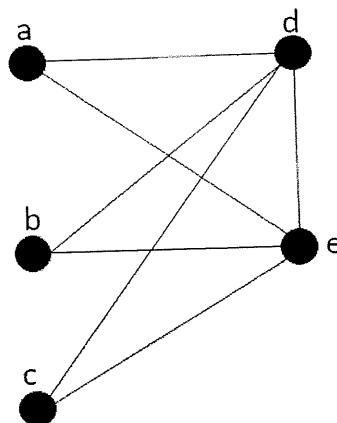


Figure 2

a) the degree of each vertex.

(5 marks)

b) determine if the graph contains an Euler circuit or neither. If an Euler circuit exists, give it down.

(2 marks)

**SECTION C (20 MARKS)**

**INSTRUCTION: ANSWER ALL QUESTIONS.**

**QUESTION 1**

Simplify each of the following expressions, giving the final answer as an integer.

a)  $\log_2 3 - \log_2 24$ . (4 marks)

b)  $\log_a a^2 - 4 \log_a \left(\frac{1}{a}\right)$ ,  $a > 0$ ,  $a \neq 1$ . (4 marks)

**QUESTION 2**

- a) New employees joining a firm clerical grade receive an annual salary of RM 8500. Every year they stay with the firm they have a salary increase of RM 800, up to a maximum of RM 13 300 per annum. How much does a new employee earn in total, up to and including the year on maximum salary? (6 marks)
- b) A new virus is circulating on a remote island. On day one there were 10 people infected, with the number of new infections increasing at a rate of 40% per day.
- i. Find the expected number of people newly infected on the 7<sup>th</sup> day. (4 marks)
  - ii. Find the expected number of infected people after one week, assuming no one has recovered yet. (2 marks)

<b>FORMULA</b>	
$x^m \cdot x^n = x^{m+n}$	$(x^m)^n = x^{mn}$
$\frac{x^n}{x^m} = x^{n-m}$	$\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$
$(xy)^n = x^n y^n$	$x^{m/n} = \sqrt[n]{x^m}$
$(x)^{-n} = \frac{1}{x^n}$	$\log_a y = x \Rightarrow y = a^x$
$\log_a xy = \log_a x + \log_a y$	$\log_a \frac{x}{y} = \log_a x - \log_a y$
$\log_a x^n = n \log_a x$	$\sum_{v \in V} \deg(v) = 2 \cdot (\text{total number of edges})$
$T_n = a + (n-1)d$	$T_n = ar^{n-1}$
$S_n = \frac{a(r^n - 1)}{r - 1}$	$S_n = \frac{n}{2} [2a + (n-1)d]$
$S_n = \frac{n}{2}(a+l)$	$S_\infty = \frac{a}{1-r}$