



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION SEMESTER II SESSION 2009/ 2010

SUBJECT NAME : DISCRETE STRUCTURE
SUBJECT CODE : BIT 1113
COURSE : 1 BIT
EXAMINATION DATE : APRIL/MAY 2010
DURATION : 2 HOURS AND 30 MINUTES
INSTRUCTION : ANSWER ALL QUESTIONS IN
PART A AND FIVE (5)
QUESTIONS ONLY FROM SIX (6)
QUESTIONS IN PART B.

PART A

Instruction: Answer **ALL** questions.

Q1 (a) Define *proposition*. (2 marks)

(b) Determine whether each of these implications is **TRUE** or **FALSE**.

- (i) if $1+1 = 2$, then $2+2 = 3$
- (ii) if buffalos can fly, then $1+1 = 3$
- (iii) if $1+1 = 2$, then buffalos can fly

(6 marks)

Q2 (a) Given the power set of A is:

$$P(A) = \{\emptyset, \{1\}, \{3\}, \{4\}, \{1, 3\}, \{1, 4\}, \{3, 4\}, \{1, 3, 4\}\}$$

- (i) List the elements of set A.
- (ii) What is $|A|$?

(4 marks)

(b) Let $A = \{3, 6, 9\}$ and $B = \{2, 4, 6, 8\}$. Let $R = \{(3, 2), (6, 2), (9, 6), (6, 8)\}$ be a relation. Is R a function from A to B? Explain your answer. (4 marks)

Q3 Given the following statement:

Let $P(x)$, $Q(x)$, and $R(x)$ be the statements “x is a student”, “x is clever”, and “x is successful”, respectively.

Express each of the following statements using quantifiers and logical connectives, where the universe of discourse is the set of all people.

- (i) All students are clever
- (ii) All clever people are successful
- (iii) No students are not clever

(6 marks)

Q4 Construct truth tables for the following statements.

(a) $(p \vee \sim q) \rightarrow r$ (3 marks)

(b) $\sim p \rightarrow (q \rightarrow r)$ (3 marks)

Q5 A sequence $b_0, b_1, b_2 \dots b_n$ is defined by letting $b_0=7$ and $b_i=b_{i-1} - 4$ for all integers $i \geq 1$. What is a general formula for this sequence for all integers $n > 0$.
 (4 marks)

Q6 Based on **FIGURE Q6**,

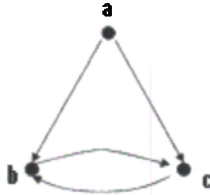


FIGURE Q6

(a) List the relation R .
 (2 marks)

(b) Find the domain and range.
 (2 marks)

Q7 Determine whether the directed graph in **FIGURE.Q7** is Euler circuit or Euler path. Explain your answer (use the degree of. vertices)

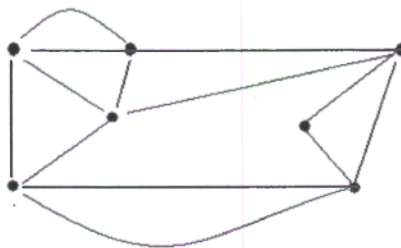


FIGURE Q7

(4 marks)

PART B

Answer **FIVE (5)** questions only.

Q8 (a) Based on the following relations, assign these pairs $(1, 1), (1, 2), (2, 1), (2, 2)$ to appropriate relations.

(i) $R_1 = \{(a, b) \mid a \leq b\}$

(ii) $R_2 = \{(a, b) \mid a > b\}$

(4 marks)

(b) Given the set $\{1, 2, 3, 4\}$, decide whether the following relations is reflexive, symmetric or transitive.

(i) $\{(2,2), (2,3), (2,4), (3,2), (3,3), (3,4)\}$

(ii) $\{(1,1), (1,2), (2,1), (2,2), (3,3), (4,4)\}$

(iii) $\{(1,2), (2,3), (3,4)\}$

(4 marks)

Q9 (a) Write an algorithm to find the maximum value from three numbers; a, b, c .

(4 marks)

(b) Answer all the questions based on a graph given in **FIGURE Q9**.

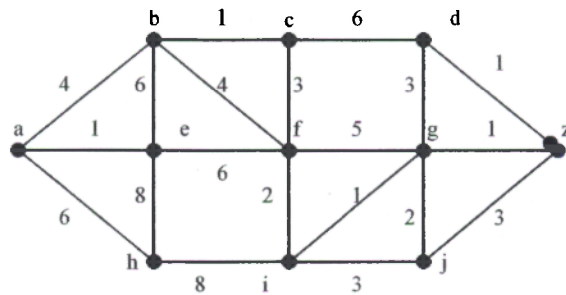


FIGURE Q9

Find the:

(i) length of the shortest path from a to i .

(ii) length of the shortest path from a to z .

(iii) length of the shortest path from a to z that passes through c .

(4 marks)

Q10 Let $A = \{1, 2, 3, 4, 5\}$ and $B = \{0, 2, 4, 6, 8\}$. Suppose R is a relation from A to B which is defined as follows. Write down the elements of R .

(a) $x R y \leftrightarrow x \geq y$.

(2 marks)

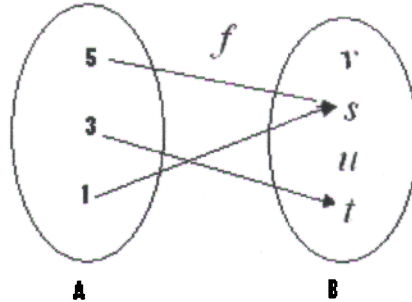
(b) $x R y \leftrightarrow x - y$ is even.

(3 marks)

(c) $x R y \leftrightarrow x + y = 7$.

(3 marks)

- Q11** (a) Let $A = \{1, 3, 5\}$ and $B = \{s, t, u, v\}$. A function f is given in **FIGURE Q11** below.

**FIGURE Q11**

- (i) Identify the domain and co-domain for function
- f
- .

$$\{(a, a), (a, b), (b, c), (c, d), (d, a), (d, b)\}$$

(3 marks)

- Q12** (a) Prove that $6 \times 7^n - 2 \times 3^n$ is divisible by 4

(4 marks)

- (b) Show that
- $\frac{n^2 + 2n}{(2n + 1)}$
- is
- $O(n^2)$

(4 marks)

- Q13** Solve the following recurrence relation,

$$a_n = 8a_{n-1} - 16a_{n-2}, \text{ where } a_0 = 1, a_1 = 2.$$

(8 marks)