



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

PEPERIKSAAN AKHIR SEMESTER II SESI 2008/2009

NAMA MATA PELAJARAN	:	STRUKTUR DISKRIT
KOD MATA PELAJARAN	:	BIT 1113
KURSUS	:	1 BIT
TARIKH PEPERIKSAAN	:	APRIL/MEI 2009
JANGKA MASA	:	2 JAM 30 MINIT
ARAHAN	:	JAWAB SEMUA SOALAN DI BAHAGIAN A DAN EMPAT(4) SOALAN SAHAJA DARIPADA ENAM (6) SOALAN DI BAHAGIAN B.

KERTAS SOALAN INI MENGANDUNGI SEBELAS (11) MUKA SURAT

SECTION A

Instruction: Answer **ALL** questions.

Q1 Identify each of the following as TRUE or FALSE.

(a) Let $A = \{1, \{2,3\}, 4\}$.

- (i) $3 \in A$
- (ii) $\{1,4\} \subset A$
- (iii) $\{2,3\} \subset A$

(3 marks)

(b) Let $A = \{x \mid x \text{ is an integer and } x^2 < 16\}$.

- (i) $\{0,1,2,3\} \subset A$
- (ii) $\{-3,-2,-1\} \subset A$
- (iii) $\{ \} \subset A$

(3 marks)

Q2 Which of the following are statements?

- (a) is 2 a positive number?
- (b) $x^2 + x + 1 = 0$
- (c) study logic
- (d) there will be snow in December.
- (e) if stock price fall, then I will lose money.

(5 marks)

Q3 Which of the following are empty sets?

- (a) $\{x \mid x \text{ is a real number and } x^2 - 1 = 0\}$
- (b) $\{x \mid x \text{ is a real number and } x^2 + 1 = 0\}$
- (c) $\{x \mid x \text{ is a real number and } x^2 = 9\}$
- (d) $\{x \mid x \text{ is a real number and } x = 2x + 1\}$
- (e) $\{x \mid x \text{ is a real number and } x = x + 1\}$

(5 marks)

Q4 If $A = \{6, 7, 8, 9\}$, find

- (a) $|A|$
- (b) $P(A)$
- (c) $|P(A)|$

(3 marks)

Q5 Let U be the set of real numbers, $A = \{x \mid x \text{ is a solution of } x^2 - 1 = 0\}$, and $B = \{-1, 4\}$. Compute:

- (a) \bar{B}
- (b) $\overline{A \cup B}$
- (c) $\overline{A \cap B}$

(3 marks)

Q6 Use $P(x)$: x is even; $Q(x)$: x is a prime number; $R(x, y)$: $x + y$ is even. The variables x and y represent integers. Write an English sentence corresponding to each of the following:

- (a) $\forall x \exists y R(x, y)$
- (b) $\neg(\exists x P(x))$
- (c) $\forall x(\neg Q(x))$

(6 marks)

Q7 (a) Write the converse and the contrapositive of this implication:

"if I have enough money, then I will buy a car and I will buy a house."

(2 marks)

SECTION B

Instruction: Answer **FOUR** questions only.

Q8 Show that the given series is true by using mathematical induction.

$$1 + 2^1 + 2^2 + \dots + 2^n = 2^{n+1} - 1.$$

(5 marks)

Q9 Let $A = \{0, 1, 2, 3, 4\}$ and define a relation R on A as follows:

$$R = \{(0, 0), (2, 1), (0, 3), (1, 1), (3, 0), (1, 4), (4, 1), (2, 2), (2, 4), (3, 3), (4, 4), (1, 2), (4, 2)\}.$$

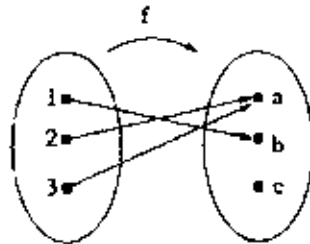
(a) Draw a directed graph for R .

(2 marks)

(b) Use the directed graph to determine whether R is reflexive, symmetric or transitive.

(3 marks)

Q10 (a) Let f be the function defined by the arrow diagram below:



(i) Find $f(1)$, $f(2)$ and $f(3)$.

(2 marks)

(ii) Determine whether the function f is injective, surjective or bijective.

(3 marks)

Q11 Solve the following recurrence relation:

(a) $a_n = 8a_{n-1} - 16a_{n-2}$, where $a_0 = 1, a_1 = 2$.

(3 marks)

(b) A person opens a bank account with a deposit of RM1000 at XYZ Bank yielding 5% per year with interest compounded annually. How much will be in the account after 7 years?

(2 marks)

Q12 (a) Answer all the questions based on a graph given in Figure Q12.

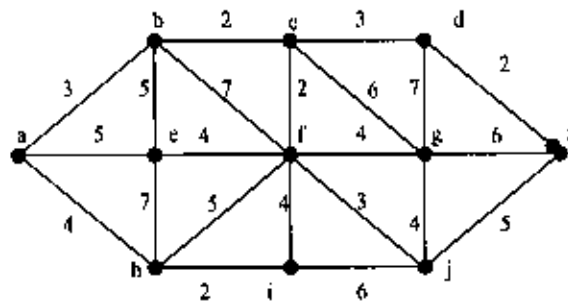


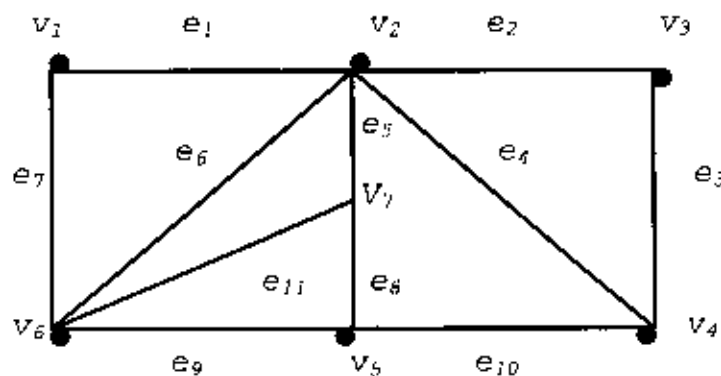
Figure Q12

Find the shortest path:

- (i) from a to z.
- (ii) from a to z.

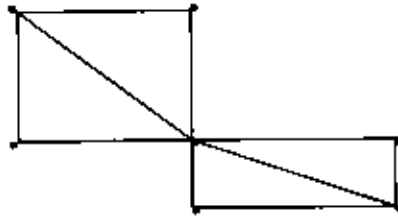
(2 marks)

(b) Determine whether the path $(v_2, v_3, v_4, v_2, v_6, v_1, v_2)$ in the graph below is a simple path, cyclic, a simple cyclic, or none of these.

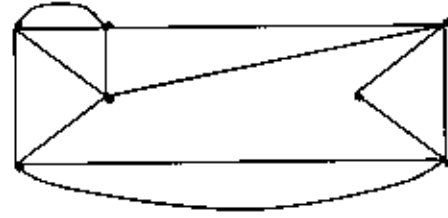


(1 mark)

- (c) Which of the graphs below have an Euler circuit or Euler path, or neither?



G1



G2

(2 marks)

- Q13 (a) Write an algorithm that returns the average value of the sequence $s_1, s_2, s_3, \dots, s_n$ (2 marks)
- (b) Write an algorithm that returns the index of the first occurrence of the value *key* in the sequence $s_1, s_2, s_3, \dots, s_n$. If *key* is not in the sequence, the algorithm returns the value 0. Example: if the sequence is

9 12 11 9 12 23

and *key* is 12, so the algorithm returns the value 2.

(3 marks)

SEKSYEN A

Arahan: Jawab SEMUA soalan.

S1 Tentukan samada pernyataan berikut BENAR atau PALSU.

(a) Diberi $A = \{1, \{2,3\}, 4\}$.

- (i) $3 \in A$
- (ii) $\{1,4\} \subset A$
- (iii) $\{2,3\} \subset A$

(3 markah)

(b) Diberi $A = \{x \mid x \text{ is an integer and } x^2 < 16\}$.

- (i) $\{0,1,2,3\} \subset A$
- (ii) $\{-3,-2,-1\} \subset A$
- (iii) $\{ \} \subset A$

(3 markah)

S2 Manakah di antara berikut adalah pernyataan?

- (a) is 2 a positive number?
- (b) $x^2 + x + 1 = 0$
- (c) study logic
- (d) there will snow in December.
- (e) if stock price fall, then I will lose money.

(5 markah)

S3 Manakah di antara berikut adalah set kosong?

- (a) $\{x \mid x \text{ adalah nombor nyata dan } x^2 - 1 \neq 0\}$
- (b) $\{x \mid x \text{ adalah nombor nyata dan } x^2 + 1 = 0\}$
- (c) $\{x \mid x \text{ adalah nombor nyata dan } x^2 = -9\}$
- (d) $\{x \mid x \text{ adalah nombor nyata dan } x = 2x + 1\}$
- (e) $\{x \mid x \text{ adalah nombor nyata dan } x = x + 1\}$

(5 markah)

S4 Jika set $A = \{6, 7, 8, 9\}$, dapatkan:

- (a) $|A|$
- (b) $P(A)$
- (c) $|P(A)|$

(3 markah)

S5 Diberi U adalah set nombor nyata, $A = \{x \mid x \text{ is a solution of } x^2 - 1 = 0\}$, dan $B = \{-1, 4\}$.
Dapatkan :

- (a) \bar{B}
- (b) $\overline{A \cup B}$
- (c) $\overline{A \cap B}$

(3 markah)

S6 Diberi $P(x)$: x adalah genap; $Q(x)$: x adalah nombor perdana; $R(x,y)$: $x + y$ adalah genap.
Pembolehubah bagi x dan y mewakili nombor integer. Tuliskan ayat menyatakan perwakilan berikut:

- (a) $\forall x \exists y R(x,y)$
- (b) $\neg(\exists x P(x))$
- (c) $\forall x(\neg Q(x))$

(6 markah)

S7 (a) Tuliskan pernyataan 'converse' dan 'contrapositive' bagi bagi pernyataan berikut:

"if I have enough money, then I will buy a car and I will buy a house."

(2 markah)

SEKSYEN B

Arahan: Jawab **EMPAT (4)** soalan daripada **ENAM (6)** soalan.

S8 Buktikan turutan berikut adalah benar menggunakan aruhan matematik.

$$1 + 2^1 + 2^2 + \dots + 2^n = 2^{n+1} - 1.$$

(5 markah)

S9 Diberi set $A = \{0, 1, 2, 3, 4\}$ dan mempunyai hubungan R sebagai :

$$R = \{(0, 0), (2, 1), (0, 3), (1, 1), (3, 0), (1, 4), (4, 1), (2, 2), (2, 4), (3, 3), (4, 4), (1, 2), (4, 2)\}$$

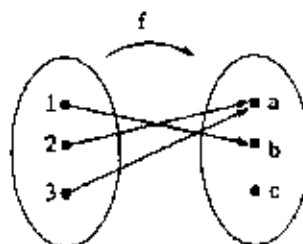
(a) Lukiskan graf terarah mewakili hubungan R .

(2 markah)

(b) Gunakan graf terarah tersebut untuk menentukan samada R adalah bersifat refleksif, simetri atau transitif.

(3 markah)

S10 (a) Andaikan f adalah fungsi yang mempunyai hubungan seperti gambarajah berikut



(i) Dapatkan $f(1)$, $f(2)$ dan $f(3)$.

(2 markah)

(ii) Tentukan samada fungsi f adalah injektif, surjektif atau bijektif.

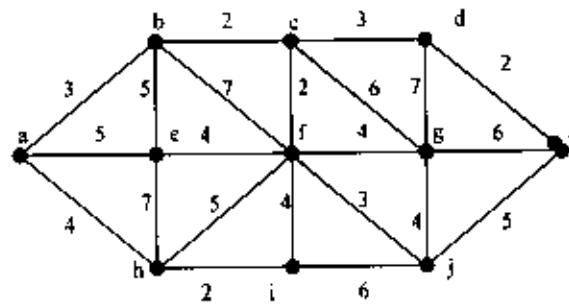
(3 markah)

S11 Selesaikan hubungan rekuren berikut:

(a) $a_n = 8a_{n-1} - 16a_{n-2}$, where $a_0 = 1, a_1 = 2$. (3 markah)

(b) Seorang pelanggan membuka akaun dengan wang deposit sebanyak RM1000 di Bank XYZ dan menerima kadar faedah sebanyak 5% setahun. Berapakah jumlah simpanan yang ada selepas 7 tahun? (2 markah)

S12 (a) Jawab soalan-soalan berikut berdasarkan graf di dalam Rajah S12.



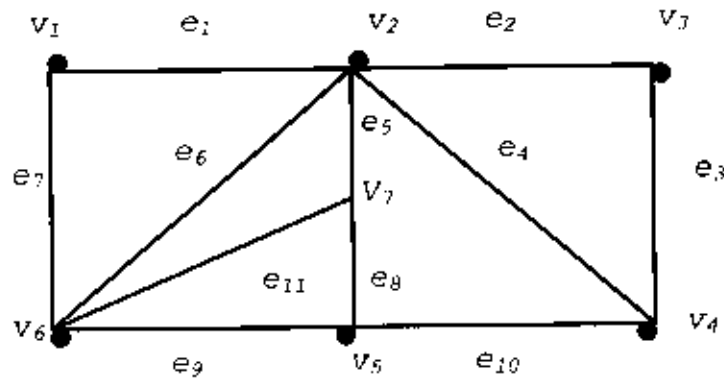
Rajah S12

Dapatkan lintasan terdekat:

- (i) daripada a ke f
- (ii) daripada a to z

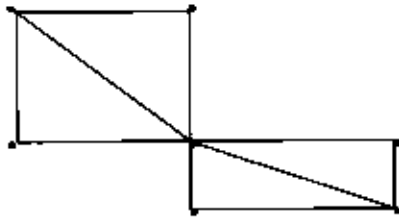
(2 markah)

(b) Tentukan samada lintasan $(v_1, v_2, v_4, v_2, v_6, v_1, v_2)$ di dalam graf di bawah adalah lintasan ringkas, atau litaran, atau litaran ringkas, atau tidak kesemuanya.

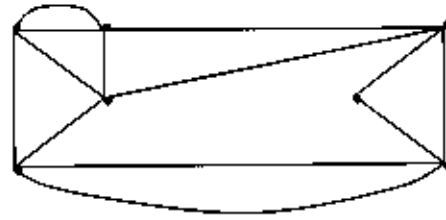


(1 markah)

- (c) Kenalpasti samada graf-graf di bawah mempunyai litaran Euler atau lintasan Euler, atau tidak kedua-duanya.



G1



G2

(2 markah)

- S13 (a) Tulis algoritma untuk mendapatkan nilai purata daripada jujukan $s_1, s_2, s_3, \dots, s_n$ (2 markah)

- (b) Tulis algoritma untuk mendapatkan indeks nilai *key* yg muncul pada kali pertama dalam jujukan $s_1, s_2, s_3, \dots, s_n$. Sekiranya *key* tidak wujud dalam jujukan tersebut, algoritma yang ditulis akan memulangkan nilai 0. Contoh: jika jujukan ialah:

9 12 11 9 12 23

dan *key* adalah 12, maka algoritma akan memulangkan nilai 2.

(3 markah)