

SULIT



JABATAN MATEMATIK, SAINS & KOMPUTER

**PENILAIAN AKHIR
SESI DISEMBER 2018**

DBM2033 : DISCRETE MATHEMATICS

**TARIKH : 11 APRIL 2019
MASA : 2.30 PTG - 4.30 PTG (2 JAM)**

Kertas ini mengandungi **DUA BELAS (12)** halaman bercetak.
Struktur (4 soalan)
Dokumen sokongan yang disertakan : Tiada

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN
(CLO yang tertera hanya sebagai rujukan)

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SECTION A : 100 MARKS
BAHAGIAN A : 100 MARKAH

INSTRUCTION:

This section consists of **FOUR (4)** subjective questions. You have to answer **ALL** questions.

ARAHAN :

Bahagian ini mengandungi EMPAT (4) soalan subjektif. Anda wajib menjawab SEMUA soalan.

QUESTION 1

SOALAN 1

CLO2
C3

- (a) Let p , q and r be the propositions.

P : You study hard.

Q : You get an A in Discrete Mathematics.

R : You are the best students.

Express the following arguments using suitable symbols.

Diberi p, q dan r adalah pernyataan.

P : Anda rajin belajar.

Q : Anda mendapat A dalam Matematik Diskret..

R : Anda adalah pelajar terbaik.

- (i) You study hard or you will not get an A in Discrete Mathematics.

[2 marks]

[2 markah]

- (ii) If you study hard, then you are the best students.

[2 marks]

[2 markah]

- (iii) You get an A in Discrete Mathematics and be the best student if and only if you study hard.

[3 marks]

[3 markah]

- (iv) You are the best student if you study hard and get an A in Discrete Mathematics

[3 marks]

[3 markah]

CLO2
C3

- (b) Construct a truth table for the compound proposition below.

Buatkan jadual kebenaran untuk pernyataan di bawah.

$$(p \wedge r) \wedge (q \rightarrow \sim r)$$

[6 marks]

[6 markah]

CLO2
C3

- (c) Solve each of these expressions below..

Selesaikan pernyataan di bawah.

(i) $00\ 1111\ 0001 \wedge 10\ 0100\ 1000 \vee 10\ 1011\ 1000$

[2 marks]

[2 markah]

(ii) $(0\ 1010 \oplus 1\ 1011) \vee 0\ 1000$

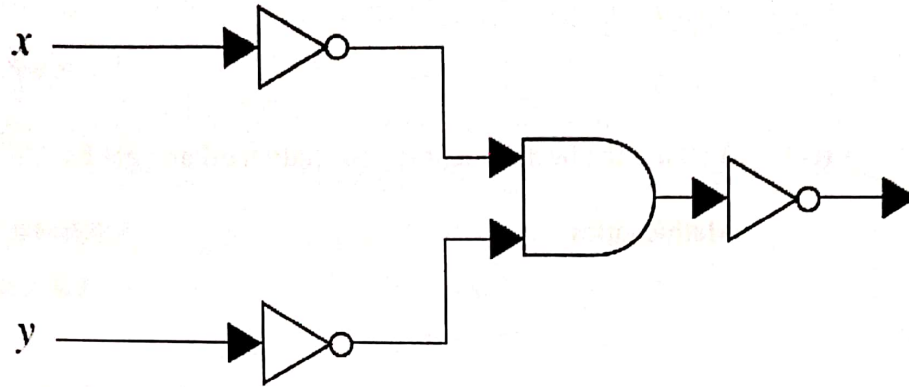
[2 marks]

[2 markah]

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CLO2
C3

(d) Find the output of the given circuit.

Carikan output untuk litar di bawah.

[2 marks]

[2 markah]

(e) Draw a logic circuit for the output below

$$\overline{((C + D).A)} + (A.B)$$

[3 marks]

[3 markah]

SULIT

QUESTION 2

SOALAN 2

CLO1
C1

- (a) Given Universal set
- $\xi = \{x: 15 \leq x \leq 35, x \text{ is an integer}\}$

$$P = \{x: x \text{ end with digit 1 or 6}\}$$

$$Q = \{x: x \text{ is a prime number}\} \text{ and}$$

$$R = \{x: x \text{ is a number where the difference between the digit is 4}\}$$

Diberi set Universal $\xi = \{x: 15 \leq x \leq 35, x \text{ adalah integer}\}$

$P = \{x: x \text{ di mana digit diakhiri dengan nombor 1 atau 6}\}$

$Q = \{x: x \text{ adalah nombor perdana}\} \text{ and}$

$R = \{x: x \text{ di mana perbezaan antara digit adalah 4}\}$

- i. Draw a Venn Diagram for the set P, Q and R.

Lukiskan gambarajah Venn untuk set P, Q dan R

[3 marks]

[3 markah]

- ii. List the elements of
- $P \cap Q$
- .

Senaraikan elemen untuk $P \cap Q$.

[1 marks]

[1 markah]

- iii. List the elements of
- $Q \cup (P \cap R)$

Senaraikan elemen untuk $Q \cup (P \cap R)$.

[2 marks]

[1 markah]

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CLO1
C1(b) Given the set $A = \{3, 6, 8, 9\}$ and set $B = \{1, 2, 3, 6, 7, 10\}$. List the element for :Diberi set $A = \{3, 6, 8, 9\}$ dan set $B = \{1, 2, 3, 6, 7, 10\}$. Senaraikan elemen untuk:a. $A - B$ b. $A \oplus B$

[4 marks]

[4 markah]

CLO1
C2(c) Given $B = \{a, b, c, d\}$ and define relations R on B as follows:Diberi $B = \{a, b, c, d\}$ dan takrifkan hubungan R pada B seperti yang berikut:

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

Determine whether relation R is reflexive, symmetric or transitive. If it is not, state the reason.

Tentukan sama ada R adalah refleksif, simetriks atau transitif. Jika tidak, nyatakan alasan anda.

[4 marks]

[4 markah]

CLO1
C2(d) Given $f(x) = x + 7$ and $g(x) = x - 4$. Determine :Diberi $f(x) = x + 7$ and $g(x) = x - 4$. Tentukan:(i) $f^{-1}(x)$

[2 marks]

[2 markah]

(ii) $(gf)^{-1}(x)$

[3 marks]

[3 markah]

(iii) $gf(5)$

[3 marks]

[3 markah]

(iv) $fg(x) = 30$, find x

[3 marks]

[3 markah]

QUESTION 3

SOALAN 3

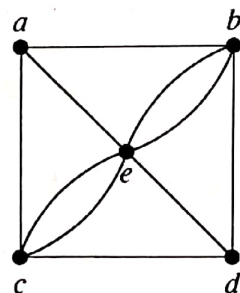
CLO2
C3

- (a) From the Figure 3.1, determine whether the given graph has an Euler circuit.

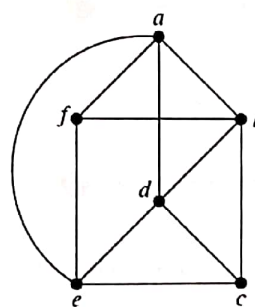
Construct such a circuit when one exists. If no Euler circuit exist, determine whether the graph has an Euler path and construct such a path of one exists.

Dari Rajah 3.1, tentukan sama ada gambarah tersebut adalah 'Euler Circuit'.

Binakan litar sekiranya ada. Sekiranya tidak wujud "Euler Circuit, tentukan sama gambarajah tersebut adalah "Euler Path" dan binakan laluan sekiranya ada.



Graph A/Graf A



Graph B/Graf B

Figure 3.1/Rajah 3.1

[4 marks]

[4 markah]

SULIT

CLO2
C3

- (b) From the Figure 3.2, determine whether the given graph has an Hamilton circuit. Construct such a circuit when one exists. If no Hamilton circuit exist, determine whether the graph has a Hamilton path and construct such a path of one exists.

Dari Rajah 3.2, tentukan sama ada gambarah tersebut adalah 'Hamilton Circuit'. Binakan litar sekiranya ada. Sekiranya tidak wujud "Hamilton Circuit, tentukan sama gambarajah tersebut adalah "Hamilton Path" dan binakan laluan sekiranya ada.

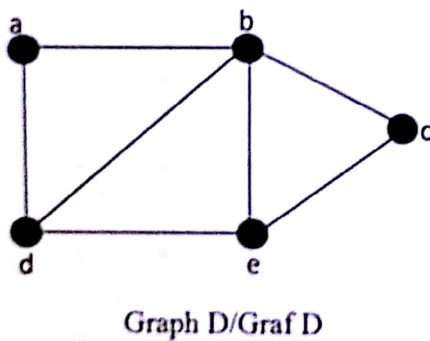
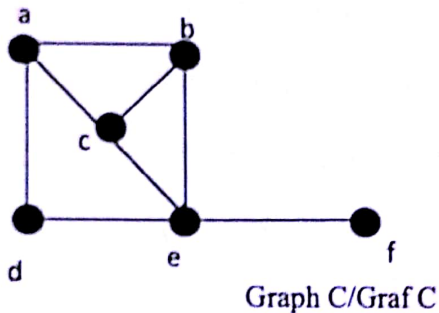


Figure 3.2/Rajah 3.2

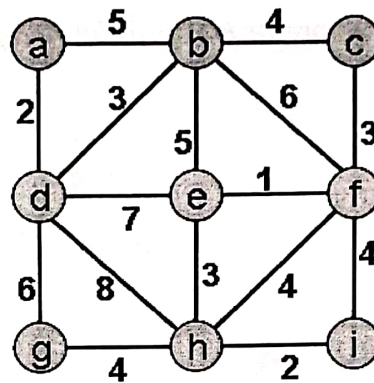
[4 marks]

[4 markah]

SULITCLO2
C3

- (c) By using Kruskal's Algorithm, build the minimal spanning tree of the weighted graph shown in Figure 3.3.

Dengan menggunakan algoritma Kruskal, binakan pokok merentang minimum untuk graf pemberat yang diberi dalam Rajah 3.3.



[5 marks]

Figure 3.3/Rajah 3.3

[5 markah]

CLO2
C3

- (d) Build a binary search tree for the words below:

Bina pokok carian dedua untuk perkataan di bawah:

- (i) Maria, Christine, Tania, Nawi, Catherine, Salman, Damia and Gapar

Maria, Christine, Tania, Nawi, Catherine, Salman, Damia dan Gapar

[3 marks]

[3 markah]

- (ii) Calculator, Paper and Stapler, Ruler, Pencil, Eraser, Bag and Pen

Kalkulator, Kertas dan Stapler, Pembaris, Pensil, Pemadam, beg dan Pen

SULIT

SULIT

[3 marks]

[3 markah]

CLO2
C3

- (e) Illustrate Pre-order, In-Order and Post-Order traversal for the tree in Figure 3.4 below.

Ilustrasikan susunan bucu bagi pokok dalam Rajah 3.4 di bawah dengan menggunakan pre-order, in-order dan post-order traversal.

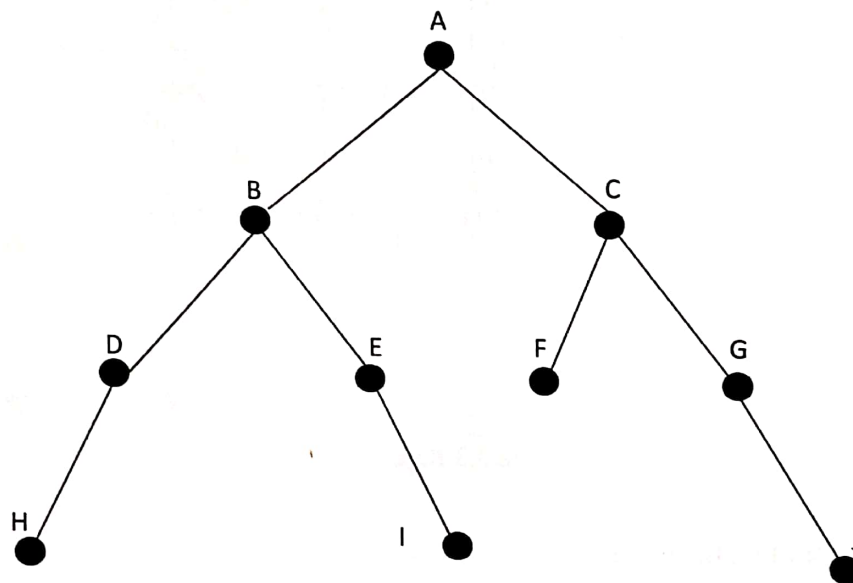


Figure 3.4/Rajah 3.4

[6 marks]

[6 markah]

SULIT

QUESTION 4

SOALAN 4

CLO1
C1

- (a) Let
- $P(n)$
- be the statement

Biar $P(n)$ sebagai pernyataan

$$1 + 3 + 5 + \cdots + (2n - 1) = n^2$$

- (i) What is the statement for
- $P(2)$
- ?

Apakah pernyataan untuk $P(2)$?

[2 marks]

[2 markah]

- (ii) Show that
- $P(1)$
- is true, completing the basis step of the proof.

Tunjukkan bahawa $P(1)$ adalah benar, lengkapkan langkah basis bagi pembuktian tersebut.

[3 marks]

[3 markah]

- (iii) What is the inductive hypothesis?

[2 marks]

[2 markah]

- (iv) What do you need to prove in the inductive step?

[3 marks]

SULIT

[3 markah]

CLO1
C2

- (b) Let
- $f(0) = 3$
- and
- $f(n + 1) = 2f(n) + 3$
- for
- $n \geq 0$
- .

Find $f(4)$.*Biar $f(0) = 1$ and $f(n + 1) = 2f(n) + 3$ for $n \geq 0$.**Cari $f(4)$.*

[7 marks]

[7 markah]

CLO1
C2

- (c) Give a recursive definition for the following if
- $n = 1, 2, 3, \dots$
- .

Berikan definisi rekursif bagi persamaan berikut jika $n = 1, 2, 3, \dots$.

(i) $K_n = 9n$

[2 marks]

[2 markah]

(ii) $K_n = 7n + 3$

[3 marks]

[3 markah]

(iii) $a_n = n(n + 1)$

[3 marks]

[3 markah]

SOALAN TAMAT