

SULIT



**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI**

JABATAN MATEMATIK, SAINS & KOMPUTER

UJIAN AKHIR

SESI JUN 2017

DBM2033: DISCRETE MATHEMATICS

**TARIKH : 10 OKTOBER 2017
MASA : 10.00 PG – 12.00 T/HARI**

Kertas ini mengandungi **SEBELAS (11)** halaman bercetak.
Struktur (4 soalan)
Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

INSTRUCTION:

This paper consists of **FOUR (4)** questions. Answer **ALL** questions.

ARAHAN:

Kertas soalan ini mengandungi **EMPAT (4)** soalan. Jawab **SEMUA** soalan.

QUESTION 1

SOALAN 1

CLO2
C2

- a) Assume $P(x)$ is the statement of "x is perfect" and $F(x)$ is "x is your friend", whereby the domain of x consists of all people. ^{C2} Translate each of these statements into logical expressions using predicates, quantifiers and logical connectives:

Andaikan $P(x)$ merupakan kenyataan "x sempurna" dan $F(x)$ adalah "x adalah kawan anda", di mana domain untuk x terdiri daripada semua manusia. Terjemahkan setiap kenyataan-kenyataan ini ke dalam ungkapan logik dengan menggunakan predikat, pengkuantiti dan pengoperasi logik:

- i. All people are not perfect.

Semua orang tidak sempurna.

[1 mark]

[1 markah]

- ii. At least one of your friends is perfect.

Sekurang-kurangnya seorang rakan anda adalah sempurna.

[2 marks]

[2 markah]

- iii. Not everybody is your friend or someone is not perfect.

Tidak semua orang adalah rakan anda atau seseorang tidak sempurna.

[2 marks]

[2 markah]

CLO2
C3

b)

- i. Calculate the bitwise **OR** and bitwise **AND** of the following pairs of bit strings:

Kirakan bitwise ATAU dan bitwise DAN bagi rentetan pasangan bit berikut:

00 1111 0001, 10 0100 1000

[2 marks]

[2 markah]

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

Selesaikan $(0\ 1010 \vee 1\ 1011) \oplus 0\ 1000$.

[3 marks]

[3 markah]

- iii. Illustrate a digital circuit that produces the output $[(\neg p \vee \neg r) \wedge \neg q] \vee [\neg p \wedge (q \vee r)]$ when given input bits p , q and r .

Lukis litar digital yang menghasilkan output $[(\neg p \vee \neg r) \wedge \neg q] \vee [\neg p \wedge (q \vee r)]$ apabila diberi input bit p , q dan r .

[5 marks]

[5 markah]

- iv. Convert the following combinatorial circuit in Figure 1(b) iv into output:

Tukar litar kombinasi dalam Rajah 1 (b) iv berikut ke bentuk output:

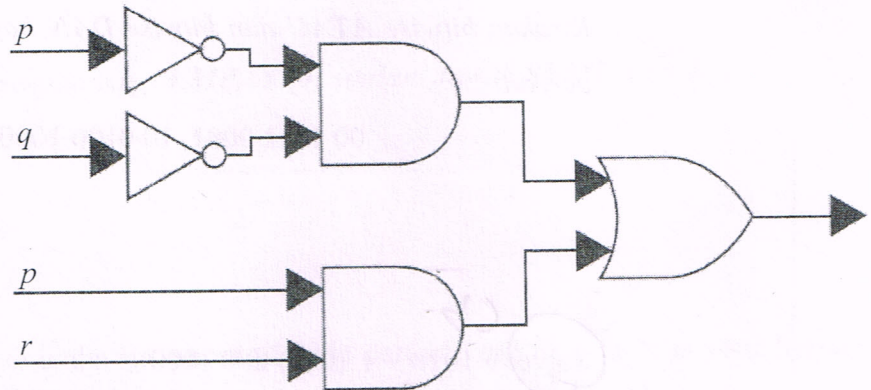


Figure 1(b) iv / Rajah 1(b) iv

[3 marks]

[3 markah]

- v. Construct truth table for $[(p \vee q) \wedge (\sim r)] \rightarrow q$.

Bina jadual kebenaran bagi $[(p \vee q) \wedge (\sim r)] \rightarrow q$.

[7 marks]

[7 markah]

QUESTION 2

SOALAN 2

CLO1
C1

- a) Given $\xi = \{x : 15 \leq x \leq 35, x \text{ is an integer}\}$, set $P = \{x : x \text{ end with digit 1 or 6}\}$, set $Q = \{x : x \text{ is a prime number}\}$ and set $R = \{x : x \text{ is a number where the difference between the digit is 4}\}$.

Diberi $\xi = \{x : 15 \leq x \leq 35, x \text{ ialah integer}\}$, set $P = \{x : x \text{ berakhir dengan angka 1 atau 6}\}$, set $Q = \{x : x \text{ ialah nombor perdana}\}$ dan set $R = \{x : x \text{ ialah nombor dengan perbezaan antara digit adalah 4}\}$.

- i. List the elements of the sets of ξ , P , Q and R .
Senaraikan unsur set ξ , P , Q dan R .

[4 marks]

[4 markah]

- ii. State $n(Q)$.
Nyatakan $n(Q)$.

[1 mark]

[1 markah]

CLO1
C2

- b) i) Let $A = \{a, b, c, d, e\}$ and R are the relation on A that is represented by the directed graph in Figure 2(b).

Andaikan $A = \{a, b, c, d, e\}$ dan R menjadi hubungan pada A yang diwakili oleh graf terarah dalam Rajah 2(b).

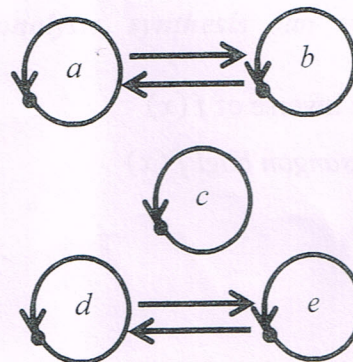


Figure 2(b) / Rajah 2(b)

- C²
a) Translate the directed graph into R.

Terjemahkan graf terarah ke dalam R.

[1 mark]

[1 markah]

- Identify C²
b) Determine whether the relation on R is reflexive, symmetric or transitive. Explain your answer.

Tentukan sama ada hubungan di R adalah refleksif, simetri atau transitif. Terangkan jawapan anda.

[6 marks]

[6 markah]

- c) Determine whether the relation on R is an equivalence relation.

Tentukan sama ada hubungan R adalah hubungan kesetaraan.

[1 mark]

[1 markah]

CLO1
C2

- b) ii) If $f(x) = \frac{x-2}{x+3}$, compute:

Jika $f(x) = \frac{x-2}{x+3}$, kira:

- a) the value of $f(-2)$

nilai $f(-2)$

[2 marks]

[2 markah]

- b) the inverse of $f(x)$

sonsangan bagi $f(x)$

[5 marks]

[5 markah]

- c) $f(f(x))$

$f(f(x))$

[5 marks]

[5 markah]

QUESTION 3

SOALAN 3

CLO2
C2

- a) Given a set of vertices, $V = \{P, Q, R, S, T, U\}$ and a set of edges,
 $E = \{(P, Q), (P, R), (P, T), (Q, R), (Q, T), (R, S), (S, T), (T, U)\}$.
 Diberi satu set bucu, $V = \{P, Q, R, S, T, U\}$ dan satu set sisi,
 $E = \{(P, Q), (P, R), (P, T), (Q, R), (Q, T), (R, S), (S, T), (T, U)\}$.

- i. Illustrate the graph.
Lukiskan graf tersebut.

[3 marks]

[3 markah]

- ii. Is the graph a multigraph? Describe your answer.
Adakah ia multigraph? Jelaskan jawapan anda.

[2 marks]

[2 markah]

CLO2
C3

b)

- i. Illustrate a binary search tree for the words **knowledge**, **comprehension**, **application**, **analysis**, **synthesis** and **evaluation** using alphabetical order.
*Lukiskan pokok carian binari perkataan **knowledge**, **comprehension**, **application**, **analysis**, **synthesis** dan **evaluation** mengikut susunan abjad.*

[5 marks]

[5 markah]

C3

- ii. Construct three (3) spanning tree for the graph in Figure 3(b) ii:
 Bina tiga (3) pokok 'spanning' bagi graf dalam Rajah 3(b) ii:

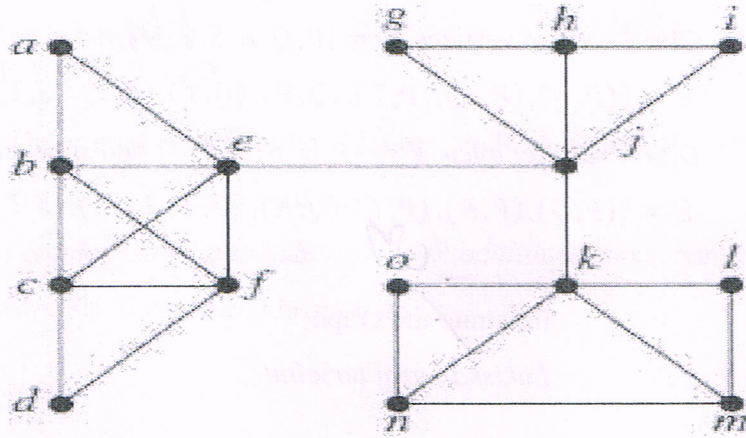


Figure 3(b) ii / Rajah 3(b) ii

[6 marks]

[6 markah]

- iii. For the following Figure 3(b) iii, shows the results of performing:
 Bagi Rajah 3 (b) iii berikut, tunjukkan keputusan melaksanakan:

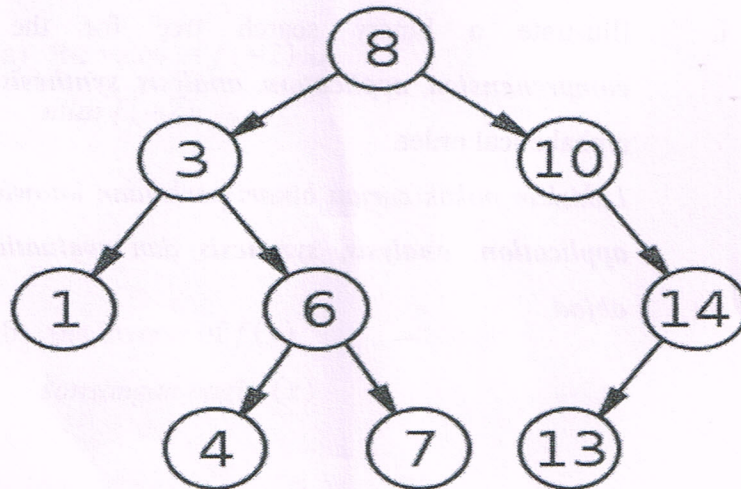


Figure 3(b) iii / Rajah 3(b) iii

- a. pre order search
carian pra susunan

[3 marks]

[3 markah]

- b. in order search
carian dalam susunan

[3 marks]

[3 markah]

- c. post order search
carian pasca susunan

[3 marks]

[3 markah]

c3

QUESTION 4

SOALAN 4

CLO1
C1

- a) Suppose that f is recursively defined by $f(0) = 1$ and $f(n+1) = \frac{2}{f(n)} + 3f(n)$.

Count: 1

Katakan f ditakrifkan secara rekursif oleh $f(0) = 1$ dan $f(n+1) = \frac{2}{f(n)} + 3f(n)$

(n). Kira:

$$\begin{aligned} f(0+1) &= \frac{2}{f(0)} + 3f(0) \\ &= \frac{2}{1} + 3(1) = 5 \end{aligned}$$

- i.
- $f(1)$

[3 marks]

[3 markah]

- ii.
- $f(2)$

$$\begin{aligned} f(1+1) &= \frac{2}{f(1)} + 3f(1) \\ &= \frac{2}{5} + 3(5) = \frac{2}{5} + 15 \end{aligned}$$

[3 marks]

[3 markah]

- iii.
- $f(3)$

$$\begin{aligned} f(2+1) &= \frac{2}{f(2)} + 3f(2) \\ &= \end{aligned}$$

[4 marks]

[4 markah]

CLO1
C2

- b) Let $P(n)$ is the statement of $1 + 4 + 7 + 10 + \dots + (3n - 2) = \frac{n(3n-1)}{2}$, where n is all positive integers.

Andaikan $P(n)$ adalah pernyataan $1 + 4 + 7 + 10 + \dots + (3n - 2) = \frac{n(3n-1)}{2}$, di mana n adalah semua integer positif.

- i. Calculate
- $P(2)$

Kirakan $P(2)$

$$\begin{aligned} P(2): 3(2)-2 \\ &= 6-2 \\ &= 4 \end{aligned}$$

$$\begin{aligned} &\frac{2(3(2)-1)}{2} \\ &= \frac{2(5)}{2} = \frac{10}{2} = 5 \end{aligned}$$

[1 mark]

[1 markah]

- ii. Show that
- $P(1)$
- is true.

Tunjukkan bahawa $P(1)$ adalah benar.

$$P(1): 3-2=1$$

$$\frac{1(2)}{2} = 1$$

[3 marks]

[3 markah]

iii. Determine $P(k)$

Tentukan $P(k)$

[1 mark]

[1 markah]

iv. Complete the inductive step.

Lengkapkan langkah induktif.

[10 marks]

[10 markah]

SOALAN TAMAT

DBM2033 DISCRETE MATHEMATICS - FORMULA

RULES OF INFERENCE					
No.	Name	Rule of Inference	No.	Name	Rule of Inference
1.	Addition	$\frac{p}{\therefore p \vee q}$	4.	Disjunctive Syllogism	$\frac{p \vee q}{\sim q} \therefore p$
2.	Modus Tollens	$\frac{p \rightarrow q}{\sim q} \therefore \sim p$	5.	Hypothetical Syllogism	$\frac{p \rightarrow q}{q \rightarrow r} \therefore p \rightarrow r$
3.	Modus Ponens	$\frac{p \rightarrow q}{p} \therefore q$			

DE MORGAN'S LAW

For Basic Logic

1. $\sim (p \vee q) = \sim p \wedge \sim q$
2. $\sim (p \wedge q) = \sim p \vee \sim q$

For Set

1. $\overline{(A \cup B)} = \overline{A} \cap \overline{B}$
2. $\overline{(A \cap B)} = \overline{A} \cup \overline{B}$

PERMUTATION WITHOUT REPETITION

$$P(n, r) = \frac{n!}{(n-r)!}$$

COMBINATION WITHOUT REPETITION

$$C(n, r) = \frac{n!}{r!(n-r)!}$$

PERMUTATION WITH REPETITION

$$P(n, r) = n^r$$

COMBINATION WITH REPETITION

$$C(n, r) = \frac{(n+r-1)!}{r!(n-1)!}$$