

SULIT



BAHAGIAN PEPERIKSAAN DAN PENILAIAN  
JABATAN PENDIDIKAN POLITEKNIK  
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN MATEMATIK, SAINS DAN KOMPUTER

PEPERIKSAAN AKHIR  
SESI DISEMBER 2015

**DBM2023: DISCRETE MATHEMATICS**

---

**TARIKH : 06 APRIL 2016**  
**MASA : 8.30 AM - 10.30 AM (2 JAM)**

---

Kertas ini mengandungi **LIMA BELAS (15)** halaman bercetak.

Bahagian A: Struktur (3 soalan)

Bahagian B: Struktur (3 soalan)

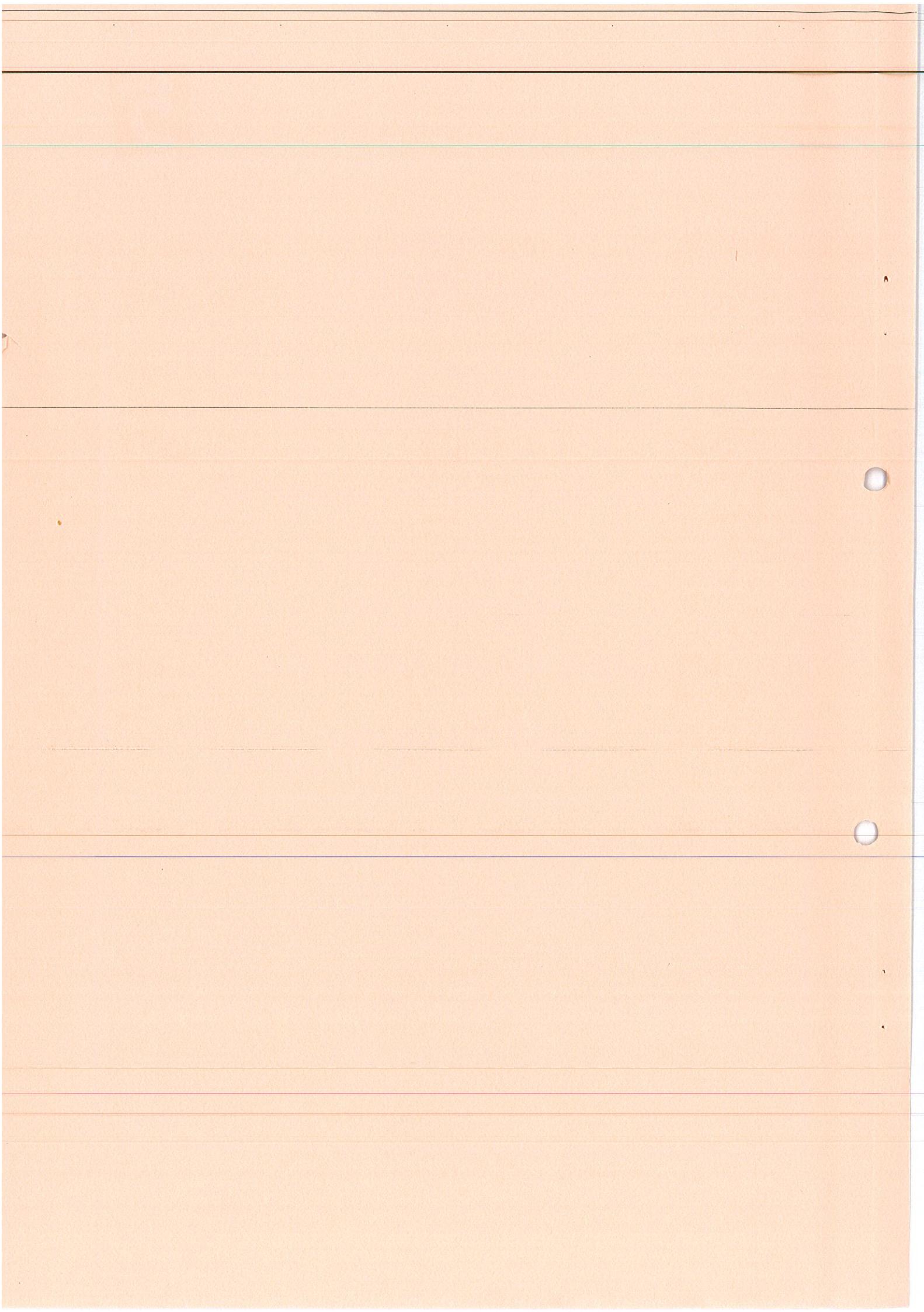
Dokumen sokongan yang disertakan : Formula

---

**JANGAN BUKA KERTAS SOALANINI SEHINGGA DIARAHKAN**

(CLO yang tertera hanya sebagai rujukan)

SULIT



**SECTION A : 50 MARKS****BAHAGIAN A : 50 MARKAH****INSTRUCTION:**

This section consists of THREE (3) questions. Answer TWO (2) questions only.

**ARAHAN:**

Bahagian ini mengandungi TIGA (3) soalan. Jawab DUA (2) soalan sahaja.

**QUESTION 1****SOALAN 1**CLO1  
C1

- a) Determine each of the following sentences whether it is a proposition or not.

*Tentukan sama ada setiap ayat berikut adalah peryataan atau tidak.*

i. The sun will rise tomorrow. [1 mark]

*Matahari akan terbit esok.* [1 markah]

ii. Give me a cup of tea. [1 mark]

*Berikan saya secawan teh.* [1 markah]

iii.  $6 + 2x = 5$ . [1 mark]

*$6 + 2x = 5$ .* [1 markah]

iv. Do you speak in English? [1 mark]

*Adakah anda bercakap dalam Bahasa Inggeris?* [1 markah]

v. Malaysia is a country in South East Asia. [1 mark]

*Malaysia merupakan sebuah negara di Asia Tenggara.* [1 markah]

- CLO 1 b) Given p, q, and r are the propositions:  
C2 p: Amira will study discrete mathematics.  
q: Amira will go to the beach.  
r: Amira is in a good mood.

*Diberi p, q, dan r sebagai pernyataan:*

*p: Amira akan belajar matematik diskret.*

*q: Amira akan pergi ke pantai.*

*r: Amira berada dalam mood yang baik.*

State each of the following propositions using the symbols and logical connectives.

*Nyatakan setiap pernyataan berikut kepada simbol dan penyambung logik.*

- i. Amira will not go to the beach and she will study the discrete mathematics.

*Amira tidak akan pergi ke pantai dan dia akan belajar matematik diskret.*

[2 marks]  
[2 markah]

- ii. If Amira does not study the discrete mathematics then Amira is not in a good mood.

*Jika Amira tidak akan belajar matematik diskret maka Amira tidak berada dalam mood yang baik.*

[3 marks]  
[3 markah]

CLO 2 c) Given the following argument:

C3 Diberi hujah berikut:

”You send me an e-mail message and I will finish writing the program.

If you do not send me an e-mail message, then I will go to sleep early.

Therefore, you send me an e-mail message or I will not go to sleep early.”

*“Anda menghantar mesej e-mel kepada saya dan saya akan selesai menulis program. Jika anda tidak menghantar mesej e-mel kepada saya, maka saya akan tidur awal. Oleh itu, anda menghantar mesej e-mel kepada saya atau saya tidak akan tidur awal.”*

i. Write down all the propositions. [3 marks]

*Tulis semua pernyataan.* [3 markah]

ii. Write down the premises and conclusion. [3 marks]

*Tulis premis-premis dan kesimpulan.* [3 markah]

iii. Determine whether the argument above is valid or invalid.

*Menentukan sama ada hujah di atas adalah sah atau tidak sah.*

[9 marks]

[9 markah]

**QUESTION 2**  
**SOALAN 2**

- CLO 3 a) The universal set,  $U = \{x: 10 \leq x \leq 25\}$ , set  $A = \{x: x \text{ is a prime number}\}$ ,  
set  $B = \{x: x \text{ is a multiple of } 3\}$  and set  $C = \{x: x \leq 15\}$ .

*Diberi set semesta,  $U = \{x: 10 \leq x \leq 25\}$ , set  $A = \{x: x \text{ adalah nombor perdana}\}$ , set  $B = \{x: x \text{ adalah gandaan } 3\}$  dan set  $C = \{x: x \leq 15\}$ .*

- i. Sketch the Venn diagram that shows all the elements of the universal set, set A, set B and set C.

*Lakarkan gambarajah Venn yang menunjukkan semua elemen di dalam set semesta, set A, set B dan set C.*

[4 marks]

[4 markah]

- ii. List all the elements of  $(A \cup B) \cap C$ .

*Senaraikan semua elemen  $(A \cup B) \cap C$ .*

[2 marks]

[2 markah]

- iii. Find  $n((A \cap C) \cup (B \cup C))$ .

*Carikan  $n((A \cap C) \cup (B \cup C))$ .*

[4 marks]

[4 markah]

CLO 3

- b) Solve the following problems.

*Selesaikan masalah-masalah yang berikut.*

C3

- i. Given  $A = \{0, 1, 2, 3\}$  and the relation  $R$  on  $A$  is defined as follows:

*Diberi  $A = \{0, 1, 2, 3\}$  dan ditakrifkan hubungan  $R$  pada  $A$  seperti yang berikut:*

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

Is  $R$  reflexive? symmetric? transitive?

If it is not, state your reason.

*Adakah  $R$  refleksif? simetriks? transitif?*

*Jika tidak, nyatakan sebab anda.*

[4 marks]

[4 markah]

- ii. Given the function  $f(x) = x - 3$  and  $g(x) = 2x + 5$ ,

find  $g^{-1}(x)$  and  $f^{-1}(x)$ .

*Diberi fungsi  $f(x) = x - 3$  dan  $g(x) = 2x + 5$ ,*

*cari  $g^{-1}(x)$  and  $f^{-1}(x)$ .*

[7 marks]

[7 markah]

- iii. Given the function  $f(x) = 3x - 9$  and  $gf(x) = x + 2$ ,

find  $g(x)$ .

*Diberi fungsi  $f(x) = 3x - 9$  dan  $gf(x) = x + 2$ , cari  $g(x)$ .*

[4 marks]

[4 markah]

## QUESTION 3

## SOALAN 3

CLO2  
C1

- a) Sketch the following graphs:

*Lakarkan graf berikut:*

- i. A linear graph of  $L_5$

[2 marks]

*Graf linear  $L_5$*

[2 markah]

- ii. A complete Bipartite graph of  $K_{5,3}$

[2 marks]

*Graf Bipartite lengkap  $K_{5,3}$*

[2 markah]

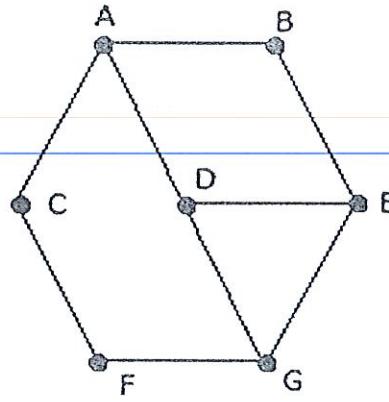
CLO2  
C2

- b) By referring to Figure 3(a), determine whether Graph A and Graph B are isomorphic. Explain your answer.

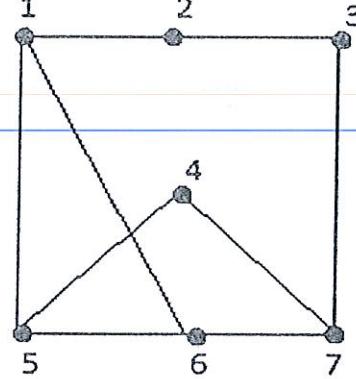
*Dengan merujuk Rajah 3(a), tentukan sama ada Graf A dan Graf B adalah isomorfik. Terangkan jawapan anda.*

[6 marks]

[6 markah]



Graph A



Graph B

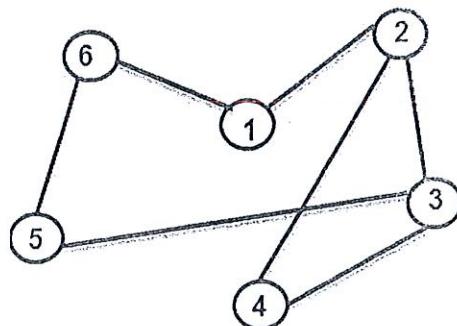
Figure 3(a) / Rajah 3(a)

CLO2

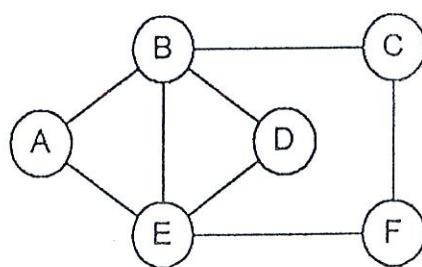
C3

- c) Answer the following questions based on the graphs in Figure 3(b).

*Jawab soalan berikut berdasarkan graf di dalam Rajah 3(b).*



Graph A



Graph B

Figure 3(b) / Rajah 3(b)

- i. Which of the graph has Euler path? Construct the path.

*Graf yang manakah mempunyai laluan Euler? Bina laluan tersebut.*

[4marks]

[4 markah]

- ii. Which of the graph has a Hamilton circuit? Construct the circuit.

*Graf yang manakah mempunyai litar Hamilton. Bina litar tersebut.*

[5 marks]

[5 markah]

- iii. Give a definition of Euler circuit. Does graph H has Euler circuit? If yes, construct the circuit.

*Berikan takrifan litar Euler. Adakah graf H mempunyai litar Euler?*

*Jika ya, bina litar tersebut.*

[6 marks]

[6 markah]

**SECTION B : 50 MARKS****BAHAGIAN B : 50 MARKAH****INSTRUCTION:**

This section consists of **THREE (3)** questions. Answer **TWO (2)** questions only.

**ARAHAN:**

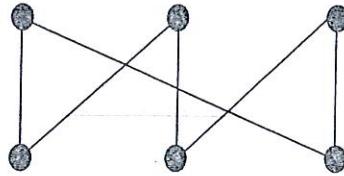
Bahagian ini mengandungi **TIGA (3)** soalan. Jawab **DUA (2)** soalan sahaja.

**QUESTION 4****SOALAN 4**CLO2  
C1

- a) Identify the following graph whether it is a tree or not. If it is not a tree, state your reason.

*Kenal pasti sama ada graf berikut adalah pepohon atau tidak. Jika tidak, nyatakan sebab anda.*

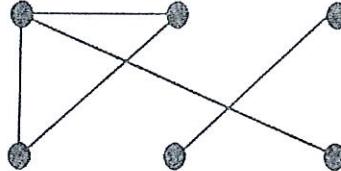
i.



[2 marks]

[2 markah]

ii.



[2 marks]

[2 markah]

CLO2

C2

- b) Based on the order rooted tree in Figure 4(a), state the pre-order, in-order and post-order traversals.

*Berdasarkan pohon susunan berakar pada Rajah 4(a), nyatakan penyusuran pra-tertib, dalam-tertib dan pasca-tertib.*

[6 marks]

[6 markah]

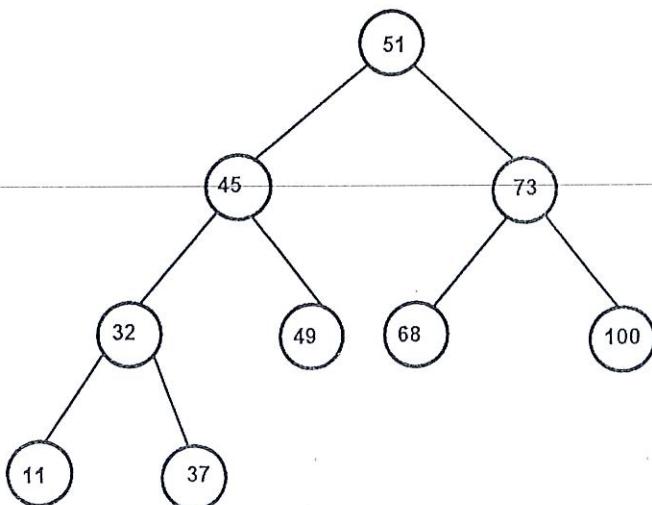


Figure 4(a) / Rajah 4(a)

CLO2  
C3

- c) Find and draw the minimum spanning tree by using

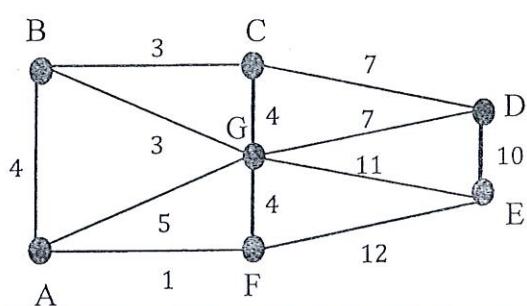
*Cari dan lukis pepohon merentang minimum dengan menggunakan*

- i. Kruskal's Algorithm

[8 marks]

*Algoritma Kruskal*

[8 markah]

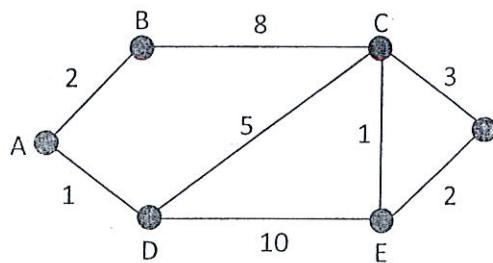


ii. Prim's Algorithm

[7 marks]

*Algoritma Prim*

[7 markah]



**QUESTION 5****SOALAN 5**

- CLO 3 a) Use mathematical induction to prove that

C2  $1^3 + 2^3 + 3^3 + \dots + n^3 = \frac{n^2(n+1)^2}{4}$  for all positive integers n.

*Gunakan aruhan matematik untuk membuktikan bahawa*

$$1^3 + 2^3 + 3^3 + \dots + n^3 = \frac{n^2(n+1)^2}{4} \text{ untuk semua integer positif } n.$$

[10 marks]  
[10 markah]

- CLO 3 b) Solve the following problems.

C3 *Selesaikan masalah-masalah berikut.*

- i. Function  $f$  is defined recursively by  $f(0) = 1$  and

$$f(n+1) = 2f(n) - f(n)^2 - 2 \text{ for } n \geq 0. \text{ Find } f(5).$$

*Fungsi  $f$  ditakrifkan dengan  $f(0) = 1$  dan*

$$f(n+1) = 2f(n) - f(n)^2 - 2 \text{ bagi } n \geq 0. \text{ Cari } f(5).$$

[10 marks]  
[10 markah]

- ii. Give a recursive definition for  $K_n = 2n - 2$  if  $n = 1, 2, 3, \dots$

*Berikan definisi rekursif bagi  $K_n = 2n - 2$  jika  $n = 1, 2, 3, \dots$*

[5 marks]  
[5 markah]

**QUESTION 6*****SOALAN 6***

CLO 1

C2

- a) Solve the following problems.

*Selesaikan masalah – masalah yang berikut.*

- i. The diagram below shows 6 letters and 4 digits

*Rajah di bawah menunjukkan 6 huruf dan 4 digit*

J K L M N O 9 8 7 6

A code is formed by using the letters and digits. Each code must consist of 3 letters, followed by 2 digits. How many different codes can be formed if repetition is not allowed?

*Kod adalah untuk dibentuk menggunakan huruf-huruf dan angka. Setiap kod mesti terdiri daripada 3 huruf, diikuti oleh 2 digit. Berapa banyak kod yang berbeza yang dapat dibentuk jika ulangan tidak dibenarkan?*

[3 marks]

[3 markah]

- ii. Find the number of arrangements for the word RESTAURANT.

*Cari bilangan susunan bagi perkataan RESTAURANT.*

[3marks]

[3 markah]

- iii. In how many ways the word RESTAURANT can be arranged without repetition when 6 of the letters are taken at a time.

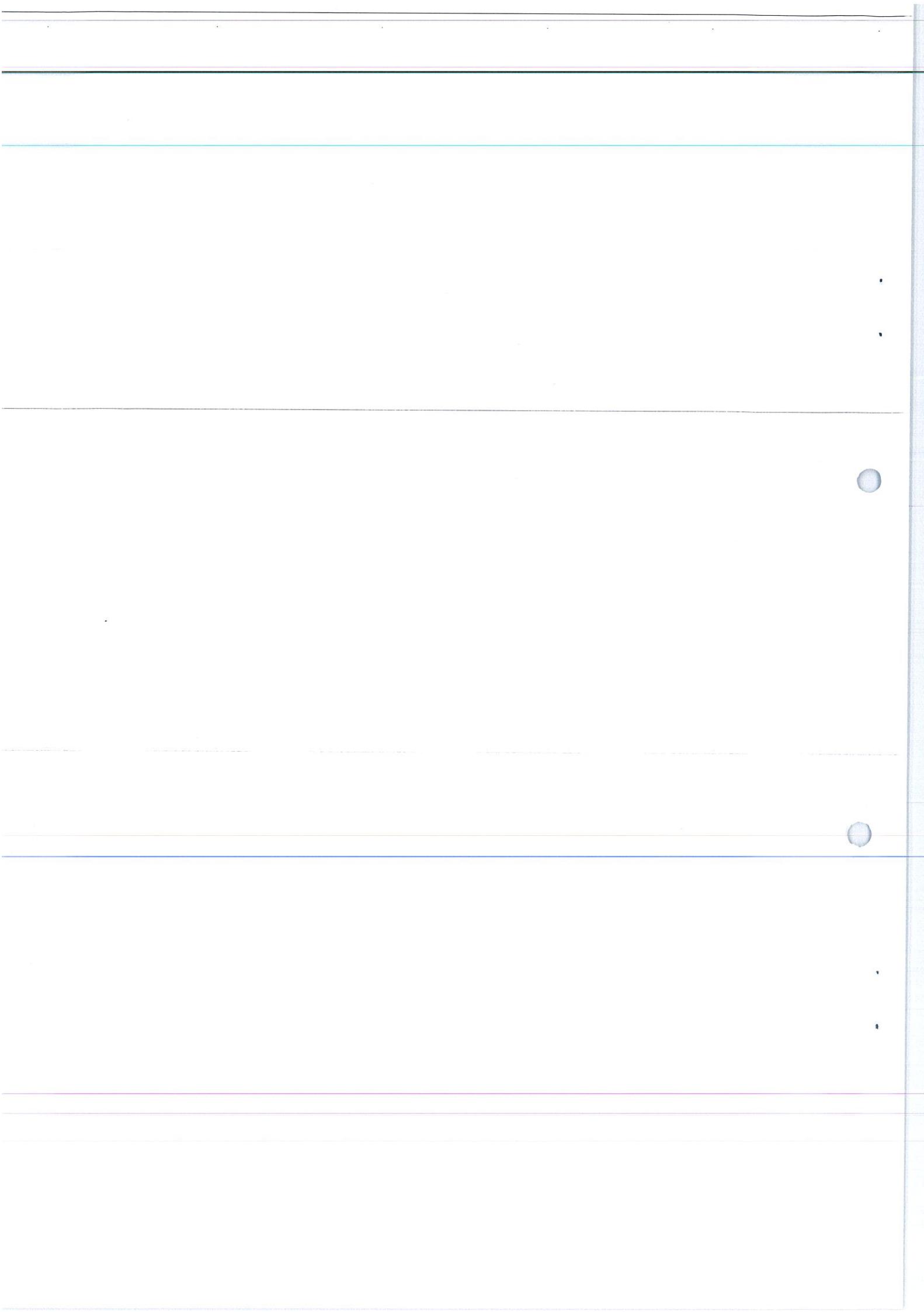
*Berapa banyakkah cara perkataan RESTAURANT boleh disusun apabila 6 huruf diambil pada satu masa tanpa pengulangan.*

[4 marks]

[4 markah]

- CLO 3      b) A committee which consists of **6 members** is selected from a group consists of 4 accountants, 6 doctors and 5 engineers. Find the possible number of selections if the committee consists of
- Satu jawatankuasa yang terdiri daripada 6 orang ahli akan dipilih daripada satu kumpulan yang terdiri daripada 4 orang akauntan, 6 orang doktor dan 5 orang jurutera. Cari bilangan pemilihan yang mungkin berlaku jika jawatankuasa itu terdiri daripada*
- i.      3 accountants, 2 doctors and 1 engineer                          [3 marks]  
*3 orang akauntan, 2 orang doktor dan seorang jurutera*                  [3 markah]
  
  - ii.     only 4 engineers    [3 marks]  
*hanya 4 orang jurutera*    [3 markah]
  
  - iii.    at least 3 accountants    [4 marks]  
*sekurang – kurangnya 3 orang akauntan*                                [4 markah]
  
  - iv.     more than 3 doctors    [5 marks]  
*lebih daripada 3 orang doktor*    [5 markah]

**SOALAN TAMAT**



## DBM2023 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	$\frac{p \vee q}{\begin{array}{l} \sim q \\ \hline \therefore p \end{array}}$
2.	Modus Tollens	$\frac{\begin{array}{l} p \rightarrow q \\ \sim q \\ \hline \therefore \sim p \end{array}}{}$	5.	Hypothetical Syllogism	$\frac{\begin{array}{l} p \rightarrow q \\ q \rightarrow r \\ \hline \therefore p \rightarrow r \end{array}}{}$
3.	Modus Ponens	$\frac{\begin{array}{l} p \rightarrow q \\ p \\ \hline \therefore q \end{array}}{}$			

### 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

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

