

SULIT



**KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI**

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

JABATAN KEJURUTERAAN AWAM

PEPERIKSAAN AKHIR

SESI II : 2023/2024

DCB20053: PLUMBING SERVICES

TARIKH : 10 JUN 2024

MASA : 2.30 PETANG – 4.30 PETANG (2 JAM)

Kertas ini mengandungi **TIGA BELAS (13)** halaman bercetak.
Bahagian A: Subjektif (2 soalan)
Bahagian B: Subjektif (4 soalan)

Dokumen sokongan yang disertakan : Lampiran

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

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

This section contains **TWO (2)** subjective questions. Answer ALL questions.

ARAHAN:

*Bahagian ini mengandungi **DUA (2)** soalan subjektif. Jawab semua soalan.*

QUESTION 1**SOALAN 1**

CLO2

- a) Find the loading unit for a coldwater distributing pipe supplying 20 water closets, 20 wash basins and 10 showers for industrial building with a high peak demand. (refer to table A1(a)).

Hitungkan unit bebanan untuk paip pengagihan air sejuk yang membekalkan 20 wc, 20 basin basuh dan 10 pancuran mandian di bangunan industri yang mempunyai permintaan puncak yang tinggi. (rujuk jadual A1(a)).

[5 mark]

[5 markah]

CLO2

- b) By using the Thomas Box formula, identify the diameter of a pipe to discharge 1.55 liter/s when the head is 4 m and the effective length is 50.5m.

Dengan menggunakan formula Thomas Box kenalpasti diameter paip untuk luahan 1.55 liter/s apabila kepala turus adalah 4m dan panjang setara ialah 50.5m.

[10 marks]

[10 markah]

CLO2

- c) Based on the data below, determine (refer to table A1(c)).
- total water storage requirement.
 - storage tank size.
 - tank thickness

Berdasarkan data di bawah , tentukan(rujuk jadual A1(c)).

- i. jumlah keperluan simpanan air.
- ii. saiz tangki simpanan.
- iii. ketebalan tangki

Table A1(c) / Jadual A1(c)

Sanitary Appliances		Units	Storage (liter)			
WC		5	180			
WB		5	90			
SHOWER		3	150			
URINAL		3	180			
SINK		3	150			
TANK CAPACITY		MODEL	INTERNAL DIMENSION			THICKNESS
GALLONS	LITRES		L	W	H	
220	1000	MT-220	1M	1M	1M	4MM
440	2000	MT-440	2M	1M	1M	4MM
660	3000	MT-660	3M	1M	1M	5MM
880	4000	MT-880	2M	2M	1M	6MM
1320	6000	MT-1320	2M	2M	2M	7MM
1760	8000	MT-1760	2M	2M	2M	8MM

[10 marks]

[10 markah]

QUESTION 2**SOALAN 2**

CLO2

- a) Find the diameter of a discharge stack and a ventilation pipe in a shopping mall if the total (DU) is 3500DUs.(refer table A2(ai) and A2(aii) in the attachment.)

Hitung diameter untuk paip tumpu dan paip pengudaraan untuk sebuah kompleks membeli-belah jika jumlah (DU) ialah 3500DU.

(rujuk jadual A2(ai) dan A2(aii) dalam lampiran.)

[5 marks]

[5 markah]

CLO2

- b) By referring to the table given, identify the diameter of stack and ventilation pipe required to carry the discharge from 8 WCS, 8 wash basins, 3 baths tub, 3 urinals and 3 shower in a 10-floor commercial building. (Refer to table A2(b), A2(ai) and A2(aii) in the attachment.)

Dengan merujuk kepada jadual yang diberikan, kenalpasti diameter paip tumpu dan paip pengudaraan yang diperlukan untuk membawa luahan dari 8WCS, 5 besin basuh, 3 tub mandi, 3 urinal dan 3 pancuran mandian di bangunan komersial 10 tingkat. (rujuk jadual A2(b),A2(ai) dan A2(aii)dalam lampiran.)

[10 marks]

[10 markah]

CLO2

- c) The diagram below shows a partial schematic diagram of the disposal pipe system for a commercial building. Based on the sketch determine:
(refer to figure A2(c) and the tables A2(ai) and A2(aii) in the attachment.)

- i. the total discharge Units at points A and C.
- ii. the size of stack pipe at point E.

Rajah di bawah menunjukkan sebahagian lakaran skematik bagi sistem paip pelupusan untuk sebuah bangunan komersial. Berdasarkan kepada lakaran tentukan : (rujuk rajah A2(C) dan jadual A2(ai) dan A2(aii) dalam lampiran.)

- i. jumlah Unit Luahan pada titik A dan C.
- ii. saiz paip tumpu pada titik E

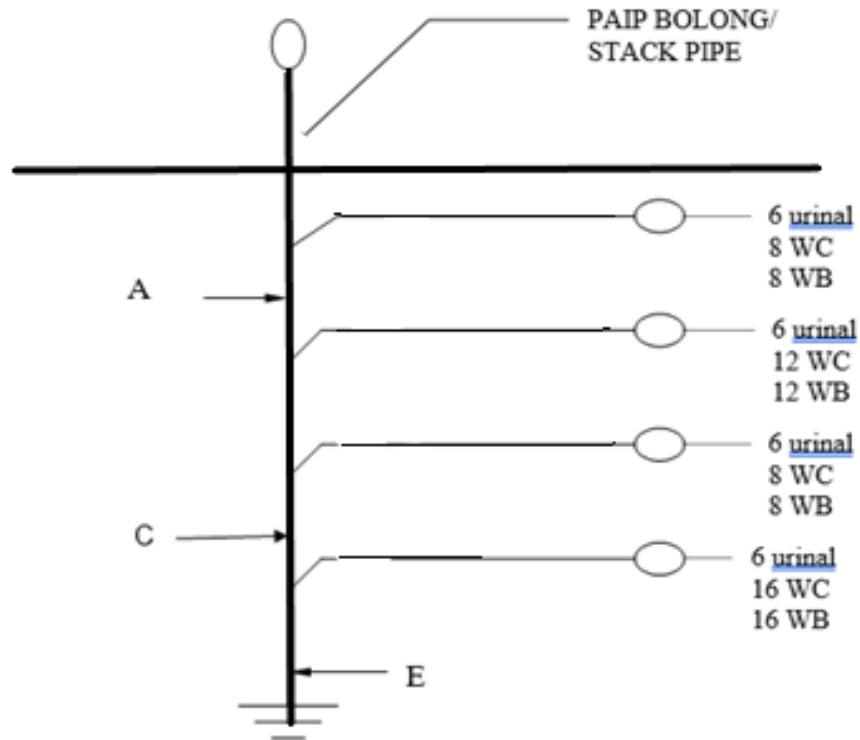


Figure A2(c) / Rajah A2(c)

[10 marks]

[10 markah]

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

This section contains **FOUR (4)** subjective questions. Answer **TWO (2)** questions only.

ARAHAN :

Bahagian ini mengandungi EMPAT (4) soalan subjektif. Jawab DU(2) soalan sahaja.

QUESTION 1***SOALAN 1***

CLO1

- a) Describe **FIVE (5)** advantages of water tank usage for a water supply system at home.

Tentukan LIMA (5) kelebihan penggunaan tangki air bagi sistem bekalan air di rumah.

[5 marks]

[5 markah]

CLO1

- b) To elucidate the transmission system of water supply, we will outline its components and functions. Understanding how water is transmitted from its source to end-users is vital for ensuring reliable access to clean water.

Explain with a diagram the transmission system of water supply as follows:

- i) Gravity system
- ii) Pump system

Untuk menjelaskan sistem penghantaran bekalan air, kami akan menghuraikan komponen dan fungsi-fungsinya. Memahami bagaimana air dihantar dari sumbernya kepada pengguna akhir adalah penting untuk memastikan bekalan air bersih dapat diakses. Terangkan dengan bantuan gambarajah sistem penghantaran bekalan air seperti berikut:

- i) Sistem graviti*
- ii) Sistem pam*

[8 marks]

[8 markah]

CLO1

- c) To illustrate the direct and indirect systems used for water supply in buildings, we will provide sketches for both systems in the context of a 2-storey bungalow. These systems play a crucial role in delivering clean water efficiently throughout the building. The direct system involves supplying water directly from the mains to the fixtures, while the indirect system incorporates a storage tank to regulate water pressure. Sketch and label the systems for a 2-storey bungalow to be built.

Untuk menggambarkan sistem langsung dan sistem tidak langsung yang digunakan untuk bekalan air dalam bangunan, kami akan menyediakan lakaran untuk kedua-dua sistem dalam konteks rumah banglo 2 tingkat. Sistem-sistem ini memainkan peranan penting dalam menghantar air bersih dengan efisien di seluruh bangunan. Sistem langsung melibatkan membekalkan air secara langsung dari paip utama ke peralatan, manakala sistem tidak langsung merangkumi tangki penyimpanan untuk mengawal tekanan air. Lakarkan dan labelkan sistem - sistem tersebut bagi sebuah banglo 2 tingkat yang akan dibina.

[12 marks]

[12 markah]

QUESTION 2**SOALAN 2**

CLO1

- a) Explain **THREE (3)** advantages and **TWO (2)** disadvantages of centralized boiler system for hot water supply.

*Terangkan **TIGA (3)** kelebihan dan **DUA (2)** kelemahan sistem dandang berpusat untuk bekalan air panas.*

[5 marks]

[5markah]

CLO1

- b) To ensure the effectiveness of the hot water supply system's design, it must meet specific requirements tailored to the needs of the building or facility. Identifying these requirements is crucial for providing reliable access to hot water for various purposes. Determine these **FOUR(4)** requirements for the hot water supply system's design.

*Untuk memastikan keberkesanan reka bentuk sistem bekalan air panas, ia harus memenuhi keperluan khusus yang disesuaikan dengan keperluan bangunan atau fasiliti. Mengenal pasti keperluan ini adalah penting untuk menyediakan akses yang boleh dipercayai kepada air panas untuk pelbagai tujuan. Tentukan **EMPAT (4)** keperluan utama untuk reka bentuk sistem bekalan air panas.*

[8 marks]

[8 markah]

CLO1

- c) To illustrate a hot water heating system using gas heating method, we will provide a diagram outlining its components and how they function. This type of system utilizes gas as the primary fuel source to heat water for various purposes. Sketch and label a diagram of a hot water heating system that is using gas heating method.

Untuk mengilustrasikan sistem pemanasan air panas menggunakan kaedah pemanasan gas, kami akan menyediakan gambarajah yang menggambarkan komponennya dan bagaimana mereka berfungsi. Jenis sistem ini menggunakan gas sebagai sumber bahan api utama untuk memanaskan air untuk pelbagai tujuan. Lakarkan gambarajah dan labelkan sistem pemanasan air panas menggunakan kaedah pemanasan gas.

[12 marks]

[12 markah]

QUESTION 3**SOALAN 3**

CLO1

a) Interpret the following terms:

- i. Stack pipe
- ii. Ventilating pipe

Tafsirkan istilah berikut:

- i. Paip tumpu
- ii. Paip pengudaraan

[5 marks]

[5 markah]

CLO1

b) To assess the advantages and disadvantages of a single stack system, it is important to consider its features and implications. This system, commonly used in plumbing, has its own set of pros and cons. Understanding these can help in making informed decisions about its implementation. Determine **FOUR (4)** advantages and **FOUR (4)** disadvantages of single stack system.

*Untuk menilai kelebihan dan kelemahan sistem tiang tunggal, adalah penting untuk mempertimbangkan ciri-cirinya dan implikasinya. Sistem ini, yang biasa digunakan dalam sistem paip, mempunyai set kelebihan dan kelemahan tersendiri. Memahami ini dapat membantu dalam membuat keputusan yang tepat tentang pelaksanaannya. Tentukan **EMPAT (4)** kelebihan dan **EMPAT (4)** keburukan sistem paip tumpu tunggal.*

[8 marks]

[8 markah]

CLO1

- c) To illustrate an automatic flushing tank, we will provide a diagram outlining its components and how they function. Automatic flushing tanks are commonly used in plumbing systems to automatically flush water fixtures at regular intervals, ensuring cleanliness and preventing the build-up of bacteria and sediment. Draw and label a diagram of automatic flushing tank.

Untuk mengilustrasikan tangki pembilasan automatik, kami akan menyediakan gambarajah yang menggambarkan komponen-komponennya dan bagaimana mereka berfungsi. Tangki pembilasan automatik biasanya digunakan dalam sistem paip untuk secara automatik membilas perkakasan air pada selang masa yang tetap, memastikan kebersihan dan mencegah penumpukan bakteria dan sedimen. Lakarkan dan labelkan gambarajah tangki simbah automatic.

[12 marks]

[12 markah]

QUESTION 4**SOALAN 4**

CLO1

a) Explain the following terms for drainage pipe work.

- i. Drainer
- i. Sewer
- iii. Private Sewer

Terangkan terma – terma berikut bagi kerja – kerja paip saliran.

- i. *Penyalir*
- ii. *Pembetung*
- iii. *Pembetung Persendirian*

[5marks]

[5 markah]

CLO1

b) To analyze the comparison between a combined drainage system and a separate drainage system, we need to understand their features, advantages, and disadvantages. Both systems play crucial roles in managing wastewater, but they differ in their approach and implementation. Determine the comparison between a combined system and a separate system for drainage.

Untuk menganalisis perbandingan antara sistem saliran gabungan dan sistem saliran berasingan, kita perlu memahami ciri-ciri, kelebihan, dan kelemahan mereka. Kedua-dua sistem memainkan peranan penting dalam pengurusan air sisa, tetapi mereka berbeza dalam pendekatan dan pelaksanaan mereka. Tentukan perbandingan diantara sistem gabungan dan sistem berasingan bagi sistem saliran.

[8 marks]

[8 markah]

CLO1

- c) To understand the alignment test for underground drainage pipes, we need to delve into its procedure and significance. This test is crucial to ensure that the pipes are properly aligned, preventing potential issues such as blockages or leaks in the drainage system. Explain with a diagram the alignment test for underground drainage pipe test as follows:

Untuk memahami ujian penjajaran untuk paip saliran bawah tanah, kita perlu menyelidik prosedurnya dan kepentingannya. Ujian ini penting untuk memastikan bahawa paip dipasang dengan betul, mencegah isu-isu yang mungkin timbul seperti penyumbatan atau kebocoran dalam sistem saliran. Terangkan dengan bantuan gambarajah ujian penjajaran bagi paip saliran bawah tanah seperti berikut:

- i. Ball test / *Ujian bebola*
- ii. Mirror test / *Ujian cermin*

[12 marks]

[12 markah]

SOALAN TAMAT

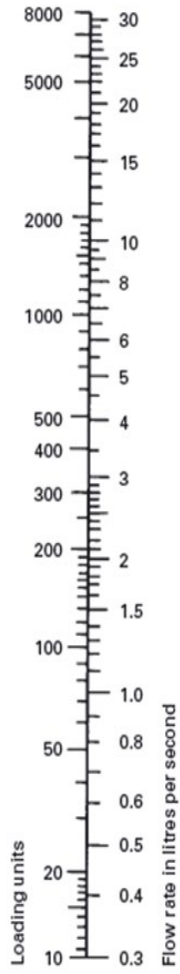
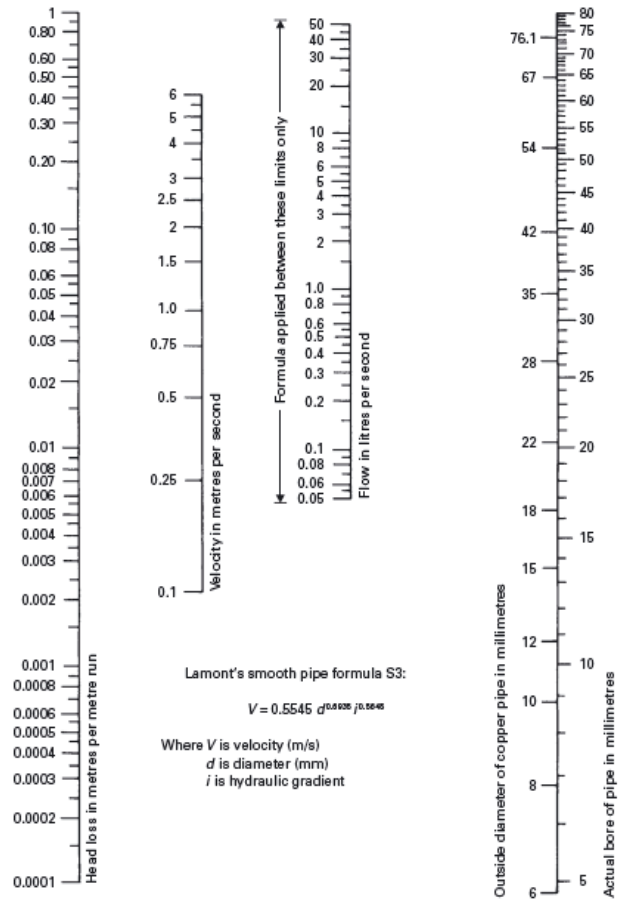


Figure 5.2
Conversion chart - loading units to flow rate



Notes Figures shown are for cold water at 12°C.
 Hot water will show slightly more favourable head loss results.
 BS 6700 gives head loss in kPa.
 1 m head = 9.81 kPa.

Figure 5.9 Determination of pipe diameter

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Table 5.1 Design flow rates and loading units

Outlet fitting	Design flow rate l/s	Minimum flow rate l/s	Loading units
WC flushing cistern single or dual flush – to fill in 2 minutes	0.13	0.05	2
WC trough cistern	0.15 per WC	0.10	2
Wash basin tap size $\frac{1}{2}$ – DN 15	0.15 per tap	0.10	1.5 to 3
Spray tap or spray mixer	0.05 per tap	0.03	–
Bidet	0.20 per tap	0.10	1
Bath tap, nominal size $\frac{3}{4}$ – DN 20	0.30	0.20	10
Bath tap, nominal size 1 – DN 25	0.60	0.40	22
Shower head (will vary with type of head)	0.20 hot or cold	0.10	3
Sink tap, nominal size $\frac{1}{2}$ – DN 15	0.20	0.10	3
Sink tap, nominal size $\frac{3}{4}$ – DN 20	0.30	0.20	5
Sink tap, nominal size 1 – DN 20	0.60	0.40	–
Washing machine size – DN 15	0.20 hot or cold	0.15	–
Dishwasher size – DN 15	0.15	0.10	3
Urinal flushing cistern	0.004 per position served	0.002	–
Pressure flushing valve for WC or urinal	1.5	1.2	–

Table 5.2 Equivalent pipe lengths (copper, stainless steel and plastics)

Bore of pipe mm	Equivalent pipe length			
	Elbow m	Tee m	Stopvalve m	Check valve m
12	0.5	0.6	4.0	2.5
20	0.8	1.0	7.0	4.3
25	1.0	1.5	10.0	5.6
32	1.4	2.0	13.0	6.0
40	1.7	2.5	16.0	7.9
50	2.3	3.5	22.0	11.5
65	3.0	4.5	–	–
73	3.4	5.8	34.0	–

Table 5.5 Recommended minimum storage of hot and cold water for domestic purposes

Type of building	Minimum cold water storage litres (l)	Minimum hot water storage litres (l)
Hostel	90 per bed space	32 per bed space
Hotel	200 per bed space	45 per bed space
Office premises:		
with canteen facilities	45 per employee	4.5 per employee
without canteen facilities	40 per employee	4.0 per employee
Restaurant	7 per meal	3.5 per meal
Day school:		
nursery	15 per pupil	4.5 per pupil
primary		
secondary		
technical	20 per pupil	5.0 per pupil
Boarding school	90 per pupil	23 per pupil
Children's home or residential nursery	135 per bed space	25 per bed space
Nurses' home	120 per bed space	45 per bed space
Nursing or convalescent home	135 per bed space	45 per bed space

Note Minimum cold water storage shown includes that used to supply hot water outlets.

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Table of Discharge unit value according to appliances

Appliance	Application	Discharge unit value
WC	Domestic	7
	Commercial	14
	Congested/public	28
Basin	Domestic	1
	Commercial	3
	Congested/public	6
Bath	Domestic	7
	Commercial	8
Sink	Domestic	6
	Commercial	14
	Congested/public	27
Shower	Domestic	1
	Commercial	2
Urinal	-	0.3
Washing machine	-	4
1 group of WC, bath and basin	-	14

Table of Discharge unit and branch discharge pipe

Nominal bore (mm)	Approximate no. of DUs.		
	Gradient		
	1/2° (9mm/m)	11/4° (22mm/m)	21/2° (45mm/m)
32	-	1	1
40	-	2	8
50	-	10	26
65	-	35	95
75	-	100	230
90	120	230	460
100	230	430	1050
125	780	1500	3000
150	2000	3500	7500

Table of Discharge unit and stack diameter

Nominal bore (mm)	Approximate no. of DUs.
50	10
65	60
75	200
100	750
125	2500
150	5500

Table of General Guide for Sizes of Ventilating Pipes

Branch or stack diameter (D)	Ventilating pipe min. diameter
Up to 75 mm bore	2/3 D (min. 25mm)
Over 75 mm bore	½ D

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Table of Manhole size and depth

Manhole depth (mm)	Manhole Size	
	Length (mm)	Width (mm)
Tidak melebihi 600mm	600	450
Antara 600-900mm	750	600
Antara 900-1500mm	750	750
Antara 1500-2400mm	900	1125

Table of Manhole Slope

Manhole pipe size (mm)	Slope	Manhole depth
100	1:40	250
150	1:60	300
225	1:90	450
300	1:100	600