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 I : 2024/2025

DCB20053: PLUMBING SERVICES

TARIKH : 10 DISEMBER 2024
MASA : 8.30PG – 10.30 PG (2 JAM)

Kertas ini mengandungi **ENAM BELAS (16)** halaman bercetak.
Bahagian A: Subjektif (2 soalan)
Bahagian B: Subjektif (4 soalan)

Dokumen sokongan yang disertakan : ~~Kertas Graf, Formula dsb~~ / Tiada

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JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SECTION A : 50 MARKS
BAHAGIAN A : 50 MARKAH

INSTRUCTION:
This section consists **TWO (2**) subjective questions. Answer **ALL** questions**.**
ARAHAN:
*Bahagian ini mengandungi **DUA (2)** soalan subjektif. Jawab **SEMUA** soalan.*

QUESTION 1
SOALAN 1

CLO2 (a) Identify the daily water requirement for the full residential hostel block of 150 students.
Kenal pasti keperluan air harian bagi blok asrama penuh berkapasiti 150 pelajar.

[5 marks]
[5 *markah*]

CLO2 (b) By using Table 1 in the appendix, estimate the daily water demand for the building that has fittings as given below:
Dengan menggunakan Jadual 1 di lampiran, anggarkan permintaan air harian bagi bangunan yang mempunyai kelengkapan seperti maklumat di bawah:

Fittings	Ground floor	1st floor	2nd floor	3rd floor
Water closet (WC)	14	14	14	14
Wash basin (wb)	18	14	14	14
Urinal	6	6	6	6
Tap	22	14	14	14
Sink	3	-	-	-

[10 marks]
[10 *markah*]

CLO2

(c) Mr. Faris informs you that he wants to add a new tank at his house.
You are required to design a pipe size with the data given below. Using the Thomas Box Formula, calculate the pipe diameter for the tank.

- Actual pipe length = 40 m (with 20% allowance)
- Discharge = 1.25 liter/seconds, Head = 5 m

En Faris memaklumkan kepada anda bahawa dia ingin menambah sebuah tangki baru di rumahnya. Anda dikehendaki untuk merekabentuk saiz paip untuk sebuah tangki berpandukan data yang diberi di bawah. Dengan menggunakan Formula Thomas Box, kirakan diameter paip yang sesuai digunakan untuk tangki tersebut.

- *Panjang paip sebenar = 40 m (dengan 20% lebih dibenarkan)*
- *Kadar alir = 1.25 liter/saat , Aras dari kepala paip = 5 m*

[10 marks]
[10 *markah*]

QUESTION 2
SOALAN 2

CLO2

(a) By referring to Table 2, identify the diameter for the discharge stack and ventilating pipe if the total number of DUs is 1200.
Dengan merujuk Jadual 2, kenalpasti diameter paip tumpu dan paip pengudaraan jika jumlah DUs adalah 1200.

[5 marks]
[5 *markah*]

CLO2

(b) The total of sanitary appliances in an 8-floor commercial building is 280 and the p-value is 0.02. Estimate the simultaneous demand factor if given $m = np + 1.8 [2np (1-p)]^{0.5}$.
Jumlah peralatan sanitari di bangunan komersial 8 tingkat adalah 280 dan nilai p ialah 0.02. Anggarkan faktor permintaan serentak jika diberi $m = np+1.8[2np (1-p)]^{0.5}$.

[10 marks]
[10 *markah*]

CLO2

(c) You are a practical student at Maju Jaya Sdn Bhd. You are required to calculate the drainage pipes, single pipes, and ventilation pipes for a 20-unit apartment building. Given the data for a 20-unit flat apartment, with 2 water closets (WC), 2 wash basins (WB), 1 bathtub, 1 sink, and 1 washing machine for every unit. Calculate:

Anda adalah seorang pelajar pratikal di syarikat Maju Jaya Sdn Berhad. Anda diminta untuk membuat pengiraan paip luahan, paip tunggal dan paip pengudaraan bagi sebuah rumah pangsa 20 unit. Diberi data bagi sebuah rumah pangsa 20-unit mempunyai 2 mangkuk tandas (WC), 2 besen basuh (WB), 1-tab mandi, 1 sinki dan 1 mesin basuh bagi setiap unit. Kirakan: -

i. Total DU value for discharge pipe
Jumlah nilai DU untuk paip luahan

ii. Diameter of discharge stack pipe
Diameter paip luahan tunggal

iii. Ventilating Stack Pipe
Paip pengudaraan

[10 marks]
[10 *markah*]

SECTION B : 50 MARKS
BAHAGIAN B : 50 MARKAH

INSTRUCTION:
This section consists of **FOUR (4)** subjective questions. Answer **TWO (2)** questions only**.**

ARAHAN:
*Bahagian ini mengandungi **EMPAT (4)** soalan subjektif. Jawab **DUA (2)** soalan sahaja.*

QUESTION 1
SOALAN 1

CLO1

(a) Explain the process of grit removal and aeration in water treatment.
Terangkan proses penyingkiran pasir dan pengudaraan dalam rawatan air.

[5 marks]
[5 *markah*]

CLO1

(b) Aqilah was asked by her friend to explain the direct and indirect type of pipe system as she was absent from class. You are requested to illustrate the piping layout of the direct and indirect system for a 10-storey building.

Aqilah diminta oleh kawannya untuk menerangkan tentang sistem paip secara langsung dan tidak langsung kerana beliau tidak hadir ke kelas. Anda minta untuk mengilustrasikan susun atur paip bagi sistem secara langsung dan tidak langsung bagi sebuah bangunan 10 tingkat.

[8 marks]
[8 *markah*]

CLO1

(c) Figure B1(c) has show a cold water storage tank used to store a large amount of supplied water for use in a building. With the help of a diagram of the cold water storage tank, explain the components of this water storage tank.

Rajah B1 (c) telah menunjukkan tangki simpanan air sejuk yang digunakan untuk menyimpan sejumlah besar air yang dibekalkan bagi kegunaan pada sesebuah bangunan. Dengan bantuan gambar rajah tangki simpanan air sejuk, Terangkan komponen tangki simpanan air ini.

Figure B1(c) / *Rajah B1(c)*

[12 marks]
[12 *markah*]

QUESTION 2
SOALAN 2

CLO1 (a) Explain the **TWO (2**) most general types of boilers in hot water system.
*Terangkan **DUA (2**) jenis dandang yang paling umum dalam sistem air panas.*
[5 marks]
[5 *markah*]

CLO1 (b) A boiler is the part of that heats up the water while the heat-up period is the duration taken to change the cold water to hot water. Explain **TWO (2)** importance of the regeneration period or heat-up period when a boiler is brought online, and conducted in slow, safe, and controlled conditions.
*Dandang merupakan perkakasan yang memanaskan air tempoh pemanasan ialah masa yang diambil untuk menukarkan air sejuk kepada air panas. Huraikan **DUA (2**) kepentingan tempoh penjanaan semula atau tempoh pemanasan apabila dandang dibawa ke atas talian, dan ia dilakukan dalam keadaan perlahan, selamat dan terkawal.*

[8 marks]
[8 *markah*]

CLO1 (c) An indirect hot water supply system is the most common type found in modern houses. The rising of the main also feeds a storage tank at a high point in the building from where the water is fed to all other pipe using gravity. Sketch and label an indirect hot water supply system for a domestic building.
Sistem bekalan air panas tidak langsung adalah jenis yang paling biasa ditemui di rumah moden. Sesalur utama yang semakin meningkat juga membekalkan tangki simpanan pada titik tinggi dalam bangunan dari mana air disalurkan ke semua paip lain dan lain-lain menggunakan graviti. Lakar dan labelkan sistem bekalan air panas secara tidak langsung bagi bangunan kediaman.

[12 marks]
[*12markah*]

QUESTION 3
SOALAN 3

CLO1 (a) Explain **FIVE (5)** requirements in designing and constructing sanitary appliances.
*Terangkan **LIMA (5)** keperluan untuk merekabentuk dan membina peralatan kebersihan.*

[5 marks]
[5 *markah*]

CLO1 (b) A device is installed at the outlet of the sanitation system to prevent foul odors from the pipes. These foul odors are blocked by the water barrier in the water trap. With the aid of a diagram, explain the factors of water loss seal in the following sanitary appliances:
Satu alat telah dipasang pada bahagian alir keluar perkakasan kebersihan yang bertujuan untuk menghalang bau busuk dari paip. Bau busuk ini akan terhalang oleh adang air yang terdapat dalam perangkap air.Dengan bantuan gambarajah, terangkan faktor-faktor kehilangan kedap air di dalam peralatan kebersihan berikut:

i. Self-siphonage / *Persifonan Kendiri*

ii. Capillary Attraction / *Tindakan Kapilari*

[8 marks]
[8 *markah*]

CLO1

(c) Air vent pipe is used to stabilize pressure in the pipe in order to prevent siphon effects.Figure B3 (c) shows the plumbing system in a building installed with has two main objectives. It supplies water for human use and gets rid of human waste. Illustrate the fully ventilated one-pipe system in a 2-storey building.

Paip pengudaraan digunakan untuk menstabilkan tekanan dalam paip bagi mengelakkan kesan sifon. Rajah B3 (c) menunjukkan sistem paip di dalam sebuah bangunan yang dipasang dengan dua objektif utama. Ia membekalkan air untuk kegunaan manusia dan untuk menyingkirkan najis manusia. Ilustrasikan sistem satu paip pengudaraan sepenuhnya di dalam sebuah bangunan 2 tingkat.

Figure B3 (c) / *Rajah B3 (c)*

[12 marks]
[12 markah]

QUESTION 4
SOALAN 4

CLO1 (a) Explain **TWO (2**) main purposes of a manhole.

*Terangkan **DUA (2)** tujuan utama lurang.*

[5 marks]
[5 *markah*]

CLO1 (b) An effective and good drainage system is needed to channel waste materials and surface water from a building. There are three types of drainage systems that are commonly used. With the aid of a diagram, explain the separate drainage system.

Sistem saliran yang berkesan dan baik diperlukan bagi mengalirkan bahan buangan dan air permukaan dari sesebuah bangunan. Terdapat tiga jenis sistem saliran yang biasa digunakan. Dengan bantuan gambarajah, terangkan sistem saliran berasingan.

[8 marks]
[8 *markah*]

CLO1 (c) After the drainage pipe is installed, it needs to be tested before backfilling work can be carried out. If the inspection and tests detect leaks or other issues, repair work can still be done and the pipe can be retested. There are 4 types of tests used for inspection. You are required to draw and label the following 2 tests. Sketch and label a diagram of the following:

i. Water Test Method
ii. Smoke Test Method

Selepas paip saliran siap dipasang, paip tersebut perlu diuji sebelum kerja-kerja kambus semula tanah dapat dilakukan. Jika pemeriksaan dan ujian yang dijalankan mengesan kebocoran atau lain-lain masalah, kerja-kerja pembaikan masih boleh dilakukan dan paip boleh diuji semula. Terdapat 4 jenis ujian yang boleh dilakukan bagi tujuan pemeriksaan. Anda diminta untuk melakar dan melabelkan gambarajah bagi 2 ujian berikut.

i. Kaedah Ujian Air

ii. Kaedah Ujian Asap

[12 marks]
[*12 markah*]

SOALAN TAMAT

APPENDIX

TABLE 1: MINIMUM STORAGE CAPACITIES FOR OTHER TYPES OF BUILDINGS

Building Type	Minimum Storage Capacity
Hotels	270 Litres / Person
Hostels	180 Litres / Person
Day Schools / Kindergarten	30 Litres / Person
Boarding Schools	180 Litres / Person
Restaurants	14 Litres / Person
Mosque Or Other Place of worship	50 Litres / Person
Barrack (Amy And Police)	250 Litres / Person
Office / Complex / Commercial (Domestic Usage)	1000 Litres / 100 m^2

TABLE 2: ESTIMATION OF WATER DEMAND BASED ON TYPES OF FITTINGS

Storage Capacity	Types of Fittings
450-900 liters	Per Shower
910 litres	Per Slipper Bath
180 litres	Per Water Closet
90 litres	Per Lavatory Basin
90 litres	Per Sink
180 litres	Per Urinal
180 litres	Per Bed Pan Washer
225 litres	Per Wash-Up Sink

Source: *Uniform Technical Guidelines Water Reticulation And Plumbing* (1st ed.). (2014). SPAN.

Thomas Box Formula

- $d = \sqrt[5]{\frac{q^2 x 25 x L x 10^5}{H}}$

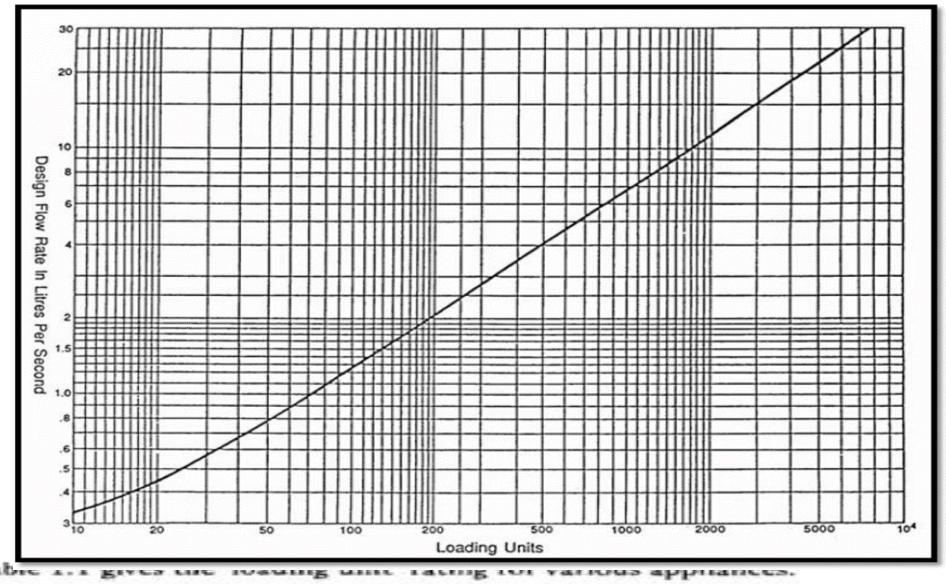

Table 1.1 gives the loading unit rating for various appliances.

Table 1.1

	Loading unit rating
Dwellings and flats	
W.C. flushing cistern	2
Wash basin	1½
Bath	10
Sink	3—5
Offices	
W.C. flushing cistern	2
Wash basin (distributed use)	1½
Wash basin (concentrated use)	3
Schools and industrial buildings	
W.C. flushing cistern	2
Wash basin	3

Table 1.3 Frictional resistances of fittings expressed in equivalent pipe lengths

Copper			Galvanised steel			
Nominal outside diameter (mm)	Metre run of pipe		Nominal outside diameter (mm)	Metre run of pipe		
	Elbow	Tee		Elbow	Bend	Tee
15	0.5	0.6	15	0.5	0.4	1.2
22	0.8	1.0	20	0.6	0.5	1.4
28	1.0	1.5	25	0.7	0.6	1.8
35	1.4	2.0	32	1.0	0.7	2.3
42	1.7	2.5	40	1.2	1.0	2.7
54	2.3	3.5	50	1.4	1.2	3.4
62	3.0	4.5	65	1.7	1.3	4.2
76	3.4	5.8	80	2.0	1.6	5.3
108	4.5	8.0	100	2.7	2.0	6.8

In calculating the diameter of a pipe to supply individual fittings, the loss of head through the draw-off tap should also be taken into account. Table 1.4 gives the allowances for draw-off taps expressed in equivalent pipe lengths.

Table 1.4 Frictional resistances of draw-off taps expressed as equivalent pipe lengths

Fitting (BS 1010)	Discharge rate tap fully open (litre/s)	Equivalent length of pipe of same diameter as tap (m)	
		Copper	Galvanised steel
15 mm diameter bib-tap or pillar tap	0.20	2.70	4.00
20 mm diameter bib-tap or pillar tap	0.30	8.50	5.75
25 mm diameter bib-tap or pillar tap	0.60	20.00	13.00

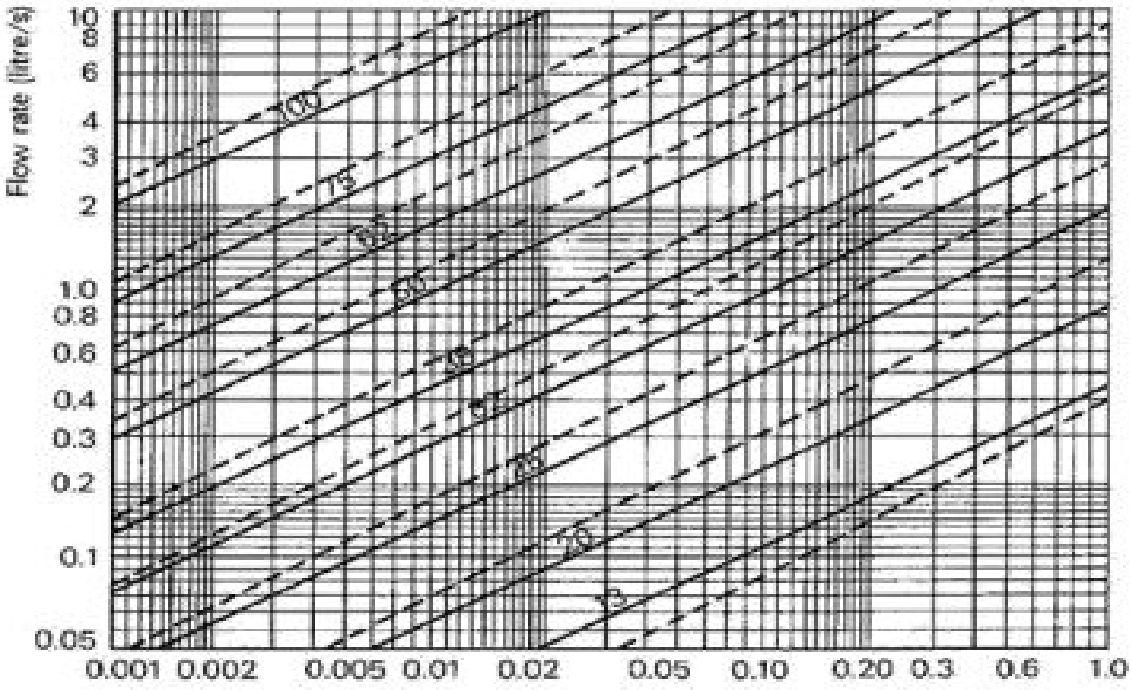

Fig.1.2 Pipe-sizing chart

Table 1: Discharge unit values

Appliance	Application	Discharge unit value
WC	Domestic Commercial Congested/public	7 14 28
Basin	Domestic Commercial Congested/public	1 3 6
Bath	Domestic Commercial	7 18
Sink	Domestic Commercial Congested/public	6 14 27
Shower	Domestic Commercial	1 2
Urinal	-	0.3
Washing machine	-	4
1 group of WC, bath and basin	-	14

Table 2: 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 3:Discharge unit and branch discharge pipe

Nominal bore (mm)	Approximate no. of DUs.		
	Gradient		
	1//2^0 (9mm/m)	11/4^0 (22mm/m)	21/2^0 (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 4: 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

Table 5: Discharge Flow Rate

Fitment	Capacity (l)	Discharge flow rate (l/s)
Basin	6	0.6
Basin – spray tap	-	0.06
Bath	80	1.1
Shower	-	0.1
Sink	23	0.9
Urinal	4.5	0.15
Washing machine	180	0.7
Water closet	6	2.3