

SULIT



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

JABATAN KEJURUTERAAN AWAM

**PEPERIKSAAN AKHIR
SESI DISEMBER 2016**

DCB2062 : ELECTRICAL SERVICES 1

**TARIKH : 04 APRIL 2017
MASA : 8.30 AM - 10.30 AM (2 JAM)**

Kertas ini mengandungi **TUJUH (7)** halaman bercetak.
Bahagian A: Struktur / Esei (2 soalan)
Bahagian B: Struktur / Esei (4 soalan)
Dokumen sokongan yang disertakan : Jadual

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

STRUCTURAL /ESSAY (100 MARKS)**STRUKTUR/ESEI (100 MARKAH)****SECTION A : 50 MARKS****BAHAGIAN A : 50 MARKAH****INSTRUCTION:**

This section consists of **TWO (2)** structural/essay questions.

Answer **ALL** questions.

ARAHAN:

Bahagian ini mengandungi DUA (2) soalan struktur/esei.

Jawab SEMUA soalan.

QUESTION 1**SOALAN 1**

- CLO 1
C1
- a) List **FIVE (5)** methods of electrical power transmission.
Senaraikan LIMA (5) kaedah penghantaran kuasa elektrik.
- [5 marks]
[5 markah]
- CLO 1
C2
- b) Describe the following power generators:
i. Hydro power plant
ii. Hydro power plant
Terangkan janakuasa berikut:
i. *Stesen janakuasa hidro*
ii. *Stesen janakuasa stim*
- [8 marks]
[8 markah]
- CLO 2
C3
- c) En. Mansor plans to build a bungalow. He wants his bungalow to be equipped with the following electrical appliances:
i. Lamp: 15 units of 100 W led light
ii. Socket outlet: 8 units of 13A switch socket outlets
iii. Air conditioning: 2 units of split type 2 H.P air conditioners
iv. Cooker: 1 unit of 2 kW oven

Calculate the current demand of the bungalow. Take into consideration the diversity factor. (Refer Table 4.1)

En Mansor merancang untuk membina sebuah rumah banglo. Dia ingin banglo tersebut dilengkapi dengan kelengkapan berikut:

- i. *Lampu: 15 unit 100W lampu kalimantang*
- ii. *Soket keluaran: 8 unit 13A soket keluaran*
- iii. *Pendingin hawa: 2 unit pendingin hawa 2 kuasa kuda jenis unit terpisah*
- iv. *Pemasak: 1 unit 2kW oven.*

Kirakan jumlah arus yang diperlukan untuk banglo tersebut dengan mengambil kira faktor kepelbagaian. (Rujuk Jadual 4.1)

[12 marks]

[12 markah]

QUESTION 2**SOALAN 2**CLO 1
C1

- a) Define protection against over load current.
Berikan definisi perlindungan terhadap lebihan arus.

[5 marks]

[5 markah]

CLO 1
C2

- b) Describe the followings:
i. Cartridge fuse
ii. Miniature circuit breaker
Huraikan perkara berikut:
i. *Fius katrij*
ii. *Pemutus litar mini*

[8 marks]

[8 markah]

CLO1
C3

- c) Illustrate the method of conducting Polarity Test.
Ilustrasikan kaedah menjalankan Ujian Kekutuban.

[12 marks]

[12 markah]

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

This section consists of **FOUR (4)** structural/essay questions.

Answer **TWO (2)** questions only.

ARAHAN:

Bahagian ini mengandungi EMPAT (4) soalan struktur/esei.

Jawab DUA(2) soalan sahaja.

QUESTION 1**SOALAN 1**CLO 1
C1

- a) i. Define 'final circuit'.
Definisikan 'litar akhir'.

[2 marks]

[2 markah]

- ii. State **THREE (3)** examples of 'final circuit'.
Nyatakan TIGA (3) contoh 'litar akhir'.

[3 marks]

[3 markah]

CLO 1
C2

- b) Compare the circuit diagram for 13A socket outlets ring circuit and radial circuit with the aid of labeled schematic symbols.
Bandingkan gambarajah litar untuk 13A soket keluaran bagi litar gelang dan litar jejari dengan bantuan simbol skematik berlabel.

[8 marks]

[8 markah]

- CLO 1
C2
- c) Explain the operation mechanism of an electromagnetic circuit breaker.
Terangkan mekanisma kendalian yang digunakan di dalam pemutus litar elektromagnetik

[12 marks]

[12 markah]

QUESTION 2

SOALAN 2

- CLO 1
C1
- a) Define the followings:
i. Conductor
ii. Insulator
Takrifkan perkara berikut:
i. Pengalir
ii. Penebat

[5 marks]

[5 markah]

- CLO 1
C2
- b) Explain the followings with the aid of diagram:
i. Cable
ii. Core
Terangkan perkara berikut dengan bantuan lakaran:
i. Kabel
ii. Teras

[8 marks]

[8 markah]

- CLO 1
C2
- c) A house using surface wiring system (single-core PVC cable) requires the socket outlet for the power load of 3.5kW. Load distance from a 240V supply source is 28 meters. Calculate the appropriate size of cable to be used for this installation.
Sebuah rumah yang menggunakan sistem pendawaian permukaan (kabel pvc teras tunggal) memerlukan soket alur keluar bagi beban berkuasa 3.5 kW. Jarak beban dari punca bekalan 240V ialah 28 meter. Kirakan saiz kabel yang sesuai digunakan bagi pemasangan ini.

[12 marks]

[12 markah]

QUESTION 3

SOALAN 3

- CLO 1
C1
- a) i Define wiring system.
Definisikan sistem pendawaian.

[2 marks]

[2 markah]

- ii. Identify **THREE (3)** factors to be considered in the choice of wiring system.
Kenalpasti TIGA (3) faktor yang dipertimbangkan dalam pemilihan sistem pendawaian.

[3marks]

[3markah]

- CLO 1
C2
- b) Explain the following wiring types:
i. Surface
ii. Conduits
iii. Trunking
iv. Concealed wiring

Terangkan jenis-jenis pendawaian berikut:

- i. Permukaan
ii. Konduit
iii. Sesalur
iv. Pendawaian tersembunyi

[8 marks]

[8 markah]

- CLO 1
C2
- c) Describe the accessories below and state each function:-
i. Socket outlet
ii. Lamp holder
iii. Switch
iv. Connector

Jelaskan aksesori di bawah dan nyatakan setiap fungsinya:-

- i. Soket keluaran
- ii. Pemegang lampu
- iii. Suis
- iv. Penyambung

[12 marks]

[12 markah]

QUESTION 4

SOALAN 4

CLO1
C1

- a) List **FIVE (5)** components of earthing system.

Senaraikan **LIMA (5)** komponen yang terdapat dalam sistem pembumian.

[5 marks]

[5 markah]

CLO1
C2

- b) Explain **FOUR (4)** methods to decrease soil resistance.

Terangkan **EMPAT (4)** kaedah untuk mengurangkan rintangan tanah.

[8 marks]

[8 markah]

CLO1
C2

- c) Explain the followings:

- i. Kilowatt hour meter
- ii. Main switch
- iii. Distribution board
- iv. Neutral link

Terangkan perkara berikut:

- i. Meter kilowatt jam
- ii. Suis utama
- iii. Kotak agihan
- iv. Perangkai neutral

[12 marks]

[12 markah]

SOALAN TAMAT

Table 4.1 Table of typical allowances for diversity (IEE On-site guide, Table 1B)

Purpose of final circuit fed from conductors or switchgear to which diversity applies	Individual household installations, including individual dwellings of a block	Type of premises	
		Small shops, stores, offices and business premises	Small hotels, boarding houses, guest houses, etc.
1 Lighting	66% of total demand	90% of total current demand	75% of total current demand
2 Heating and power (but see 3-8 below)	100% of total current demand up to 10 A +50% of any current demand in excess of 10 A	100% f.l. of largest appliance +75% of remaining appliances	100% f.l. of largest appliance +80% f.l. of second largest appliance +60% of remaining appliances
3 Cooking appliances	10 A +30% f.l. of connected cooking appliances in excess of 10 A +5 A if socket-outlet incorporated in unit	100% f.l. of largest appliance +80% f.l. of second largest appliance +60% f.l. of remaining appliances	100% of largest appliance +80% f.l. of second largest appliance +60% f.l. of remaining appliances
4 Motors (other than lift motors which are subject to special consideration)		100% f.l. of largest motor +80% f.l. of second largest motor +60% f.l. of remaining motors	100% f.l. of largest motor +50% f.l. of remaining motors
5 Water heaters (instantaneous type)*	100% f.l. of largest appliance +100% of second largest appliance +25% f.l. of remaining appliance	100% f.l. of largest appliance +100% of second largest appliance +25% f.l. of remaining appliances	+100% f.l. of largest appliance +100% of second largest appliance +25% f.l. of remaining appliances
6 Water heaters (thermostatically controlled)	NO DIVERSITY ALLOWABLE [†]		
7 Floor warming installations	NO DIVERSITY ALLOWABLE [†]		
8 Thermal storage space heating installations	NO DIVERSITY ALLOWABLE [†]		
9 Standard arrangements of final circuits in accordance with IEE Appendix 5	100% of current demand of largest circuit +40% of current demand of every other circuit	100% of current demand of largest circuit +50% of current demand of every other circuit	
10 Socket outlets other than those included in 9 above and stationary equipment other than those listed above	100% of current demand of largest point of utilisation +40% of current demand of every other point of utilisation	100% of current demand of largest point of utilisation +75% of current demand of every other point of utilisation	100% of current demand of largest point of utilisation +75% of current demand of every point in main rooms (dining rooms, etc.) +40% of current demand of every other point of utilisation

* For the purpose of this table an instantaneous water heater is deemed to be a water heater of any loading which heats water only while the tap is turned on and therefore uses electricity intermittently.

[†] It is important to ensure that the distribution boards are of sufficient rating to take the total load connected to them without the application of any diversity.

Table 4.1/Jadual 4.1

Table 4.1 Table of typical allowances for diversity (IEE On-site guide, Table 1B)

Purpose of final circuit fed from conductors or switchgear to which diversity applies	Individual household installations, including individual dwellings of a block	Type of premises	
		Small shops, stores, offices and business premises	Small hotels, boarding houses, guest houses, etc.
1 Lighting	66% of total demand	90% of total current demand	75% of total current demand
2 Heating and power (but see 3-8 below)	100% of total current demand up to 10 A +50% of any current demand in excess of 10 A	100% f.l. of largest appliance +75% of remaining appliances	100% f.l. of largest appliance +80% f.l. of second largest appliance +60% of remaining appliances
3 Cooking appliances	10 A +30% f.l. of connected cooking appliances in excess of 10 A +5 A if socket-outlet incorporated in unit	100% f.l. of largest appliance +80% f.l. of second largest appliance +60% f.l. of remaining appliances	100% of largest appliance +80% f.l. of second largest appliance +60% f.l. of remaining appliances
4 Motors (other than lift motors which are subject to special consideration)		100% f.l. of largest motor +80% f.l. of second largest motor +60% f.l. of remaining motors	100% f.l. of largest motor +50% f.l. of remaining motors
5 Water heaters (instantaneous type)*	100% f.l. of largest appliance +100% of second largest appliance +25% f.l. of remaining appliance	100% f.l. of largest appliance +100% of second largest appliance +25% f.l. of remaining appliances	+100% f.l. of largest appliance +100% of second largest appliance +25% f.l. of remaining appliances
6 Water heaters (thermostatically controlled)	NO DIVERSITY ALLOWABLE†		
7 Floor warming installations	NO DIVERSITY ALLOWABLE†		
8 Thermal storage space heating installations	NO DIVERSITY ALLOWABLE†		
9 Standard arrangements of final circuits in accordance with IEE Appendix 5	100% of current demand of largest circuit +40% of current demand of every other circuit	100% of current demand of largest circuit +50% of current demand of every other circuit	
10 Socket outlets other than those included in 9 above and stationary equipment other than those listed above	100% of current demand of largest point of utilisation +40% of current demand of every other point of utilisation	100% of current demand of largest point of utilisation +75% of current demand of every other point of utilisation	100% of current demand of largest point of utilisation +75% of current demand of every point in main rooms (dining rooms, etc.) +40% of current demand of every other point of utilisation

* For the purpose of this table an instantaneous water heater is deemed to be a water heater of any loading which heats water only while the tap is turned on and therefore uses electricity intermittently.

† It is important to ensure that the distribution boards are of sufficient rating to take the total load connected to them without the application of any diversity.

Table 9D1/Jadual 9D1

KEUPAYAAN MEMBAWA-ARUS (AMPERE)

Luas keratan rentas pengalir	Kaedah Rujukan 4 (tertutup dalam konduit pada dinding yang bertebatkan terma)		Kaedah Rujukan 3 (terletak dalam konduit di dinding atau dalam penyaluran)		Kaedah Rujukan 4 (Diklip terus)		Kaedah Rujukan 11 (atas talam kabel berlubang, menegak atau melintang)	
	2 kabel au atau at fasa tunggal	3 atau 4 kabel, au fasa tiga	2 kabel, au atau at fasa tunggal	3 atau 4 kabel, au fasa tiga	2 kabel au atau at fasa tunggal	3 atau 4 kabel, au fasa tiga	2 kabel, au fasa tunggal atau at rata dan bersentuh	3 kabel au fasa tiga rata dan bersentuh atau trefoil
1	2	3	4	5	6	7	8	9
mm ²	A	A	A	A	A	A	A	A
1	11	10.5	13.5	12	15.5	14	-	-
1.5	14.5	13.5	17.5	15.5	20	18	-	-
2.5	19.5	18	24	21	27	25	-	-
4	26	24	32	28	37	33	-	-
6	34	31	41	36	47	43	-	-
10	46	42	57	50	65	59	-	-
16	61	56	76	68	87	79	-	-
25	80	73	101	89	114	104	126	112
35	99	89	125	110	141	129	156	141
50	119	108	151	134	182	167	191	172

PENURUNAN VOLT (mV/A/m)

2 kabel - a.t. fasa-tunggal										
Luas keratan rentas pengalir	2 kabel at	Kaedah Rujukan 3 dan 4 (Terletak dalam konduit dll. pada atau atas dinding)	Kaedah Rujukan 1 dan 11 (Diklip terus atau di atas talam, bersentuh)	Kaedah Rujukan 12 (Beruang)*	Kaedah Rujukan 3 dan 4 (Terletak dalam konduit dll. pada atau atas dinding)					
		3	4		6					
1	2	3	4	5	6					
mm ²	mV	mV	mV	mV	mV					
1	44	44	44	38	44					
1.5	29	29	29	29	25					
2.5	18	18	18	18	15					
4	11	11	11	11	9.5					
6	7.3	7.3	7.3	7.3	6.4					
10	4.4	4.4	4.4	4.4	3.8					
16	2.8	2.8	2.8	2.8	2.4					
	r	x	z	r	x	z				
25	1.75	1.80	0.33	1.80	1.75	0.29	1.80	1.50	0.29	1.55
35	1.25	1.30	0.31	1.30	1.25	0.195	1.25	1.25	0.28	1.30
50	0.93	0.95	0.30	1.00	0.93	0.190	0.95	0.93	0.28	0.97
	r	x	z	r	x	z	r	x	z	
	0.81	0.26	0.85							