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 MEKANIKAL

PEPERIKSAAN AKHIR

**SESI I : 2025/2026**

# DJJ20053: ELECTRICAL TECHNOLOGY

**TARIKH : 10 DISEMBER 2025**
**MASA : 11.30 PAGI - 1.30 PETANG (2 JAM)**

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Kertas ini mengandungi **SEMBILAN (9)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

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**JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN**

(CLO yang tertera hanya sebagai rujukan)

**INSTRUCTION:**

This section consists of **FOUR (4)** structured questions. Answers **ALL** questions.

***ARAHAN:***

*Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **SEMUA** soalan.*

**QUESTION 1**

***SOALAN 1***

CLO1

(a) Define electrical charge, current and resistivity.
*Takrifkan cas elektrik, arus dan kerintangan.*

[6 marks]
[6 *markah*]

CLO2

(b) A series circuit consists of 15Ω resistor, 25Ω resistor and 30Ω resistor connected to a 140V battery. Express the value of:
*Litar bersiri terdiri daripada perintang 15Ω, perintang 25Ω dan perintang 30Ω yang disambungkan kepada bateri 140V. Nyatakan nilai bagi:*

i. Total resistance of the circuit.
*Jumlah rintangan litar.*

[4 marks]
[4 *markah*]

ii. Current flowing through the circuit
*Arus yang mengalir dalam litar*

[4 marks]
[4 *markah*]

CLO2

(c) Based on the circuit in Figure 1(c). Calculate:

*Berdasarkan litar pada Rajah 1(c), Kirakan:*

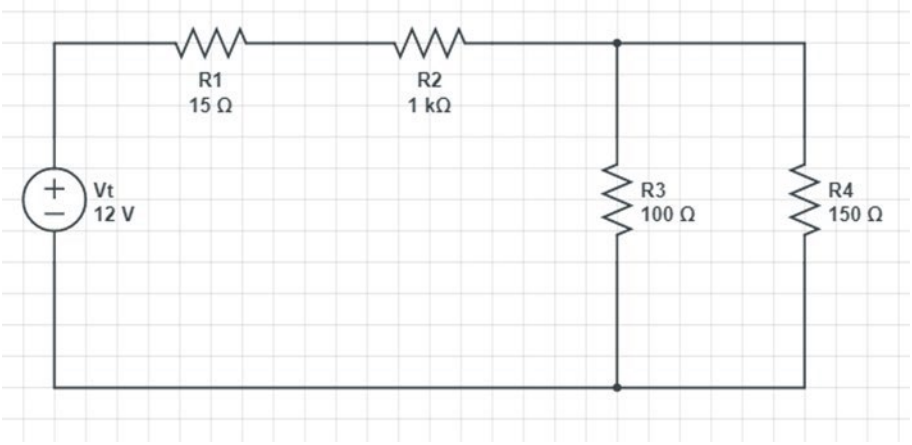


Figure 1(c)/ *Rajah 1(c)*

i. Total resistance, $R_T$

*Jumlah rintangan, $R_T$*

[6 marks]

[6 *markah*]

ii. Total Current, $I_T$

*Jumlah arus, $I_T$*

[2 marks]

[2 *markah*]

iii. Current through $R_4$ using the Current Divider Law, $I_4$

*Arus yang melalui $R_4$ dengan menggunakan Hukum Pembahagi Arus, $I_4$*

[3 marks]

[3 *markah*]

**QUESTION 2**

***SOALAN 2***

CLO1

(a) List **TWO (2)** types of inductors and the functions.
*Senaraikan **DUA (2)** jenis peraruh dan fungsinya.*

[6 marks]
[6 *markah*]

CLO2

(b) Using a diagram express the value of total capacitance of three capacitors. Given each capacitor has 120 μF of capacitance connected in:
*Dengan menggunakan gambar rajah, nyatakan nilai jumlah kemuatan bagi tiga kapasitor. Diberi setiap kapasitor mempunyai nilai 120 μF kapasitans yang disambungkan secara:*

i. Series
*Sesiri*

[4 marks]
[4 *markah*]

ii. Parallel
*Selari*

[3 marks]
[3 *markah*]

CLO2

(c) A RL series circuit has 10 Ω resistor, 0.2 H inductor and is supplied with 250V, 50 Hz AC
*Sebuah litar sesiri RL mempunyai 10Ω perintang, 0.2 H peraruh dan voltan bekalan 250 V, 50Hz AC*

i. Sketch the diagram of the series circuit.
*Lakarkan gambarajah litar sesiri tersebut*

[2 marks]
[2 *markah*]

Calculate:

*Kirakan:*

ii. Impedance, Z

*Galangan, Z*

[4 marks]

[4 *markah*]

iii. Current, I

*Arus, I*

[3 marks]

[3 *markah*]

iv. Phase angle, Θ

*Sudut fasa, Θ*

[3 marks]

[3 *markah*]

**QUESTION 3**

***SOALAN 3***

CLO1

(a) Define electromagnetic strength and reluctance.

*Takrifkan kekuatan elektromagnet dan keengganan.*

[6 marks]

[6 *markah*]

CLO2

(b) Consider a coil of 700 turns wound uniformly on a non-magnetic ring with a mean circumference of 64 cm and a cross-sectional area of 9 cm², carrying a current of 3A. Express the value off:

*Pertimbangkan gegelung yang mempunyai 700 lilitan dililit secara seragam pada gelang bukan magnet dengan lilitan purata 64 cm dan luas keratan rentas 9 cm², membawa arus 3A. Nyatakan nilai bagi:*

i. The magnetic field strength, H

*Kekuatan medan magnet, H*

[4 marks]

[4 *markah*]

ii. The flux density, B

*Ketumpatan fluks, B*

[4 marks]

[4 *markah*]

CLO2

(c) A mild steel core having an average length of 5cm and a cross -sectional area of 1cm2 is wound with 500 turns of conductor. A current of 1A passed through the winding. If the relative permeability of the core is 860, calculate:

i. The resulting Magnetic Force, Fm

*Daya Gerak Magnet yang terhasil*

[3 marks]

[3 *markah*]

ii. Magnetic Field Strength on the core, H

*Kekuatan Medan Magnet pada teras*

[3 marks]
[3 *markah*]

iii. Flux Density at the core, B

*Ketumpatan Fluks pada teras*

[3 marks]
[3 *markah*]

iv. Reluctance on the core, S

*Engganan pada teras*

[2 marks]
[2 *markah*]

**QUESTION 4**

***SOALAN 4***

CLO1

(a) State any **SIX (6)** parts of a DC generator.
*Nyatakan **ENAM (6)** bahagian asas Penjana AT.*

[6 marks]
[6 *markah*]

CLO2

(b) A 4-pole, 3 phase, 50 Hz induction motor runs at 1440 rpm at full load. Express the value of:
*Motor aruhan 4 kutub, 3 fasa, 50 Hz bergerak pada 1440 rpm pada beban penuh. Nyatakan nilai bagi:*

i. The synchronous speed, Ns
*Kelajuan segeraknya*

[2 marks]
[2 *markah*]

ii. Percent of the slip, S
*Peratus gelinciran*

[3 marks]
[3 *markah*]

iii. The frequency of the rotor induced EMF's, fr
*Frequency rotor yang mengaruhkan EMF*

[2 marks]
[2 *markah*]

CLO2

(c) A 60kVA transformer, 4600V/240V, 50Hz primary winding of 320. Assuming that there is no voltage drop in the coil, calculate:
*Sebuah pengubah 60kVA, 4600V/240V, 50Hz mempunyai 320 lilitan primer. Dengan menganggap tiada kejatuhan voltan di dalam gegelung, kirakan:*

i. The number of secondary winding
*Bilangan lilitan sekunder*

[4 marks]
[4 *markah*]

ii. The maximum flux
*Nilai fluks maksimum*

[4 marks]
[4 *markah*]

iii. The value of the primary current and the secondary current at full load.
*Nilai arus primer dan arus sekunder pada beban penuh*

[4 marks]
[4 *markah*]

**SOALAN TAMAT**

# DJJ20053 – ELECTRICAL TECHNOLOGY

## FORMULA

### INTRODUCTION TO ELECTRICAL CIRCUITS

$$R = \frac{\rho l}{A} \qquad C = \frac{Q}{V}$$
$$V = IR \qquad P = IV$$
$$E = Pt$$

### SERIES

$$V_T = V_1 + V_2 + \cdots + V_n$$
$$I_T = I_1 = I_2 = \cdots = I_n$$
$$R_T = R_1 + R_2 + \cdots + R_n$$
$$L_T = L_1 + L_2 + \cdots + L_n$$
$$\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \cdots + \frac{1}{C_n}$$
$$V_X = \frac{R_X}{R_T} V_T$$

### PARALLEL

$$V_T = V_1 = V_2 = \cdots = V_n$$
$$I_T = I_1 + I_2 + \cdots + I_n$$
$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots + \frac{1}{R_n}$$
$$\frac{1}{L_T} = \frac{1}{L_1} + \frac{1}{L_2} + \cdots + \frac{1}{L_n}$$
$$C_T = C_1 + C_2 + \cdots + C_n$$
$$I_X = \frac{R_T}{R_X} I_T$$

### ALTERNATING CURRENT CIRCUIT

### RL CIRCUIT

$$I = \frac{V}{Z}$$
$$V_L = IX_L$$
$$Z = \sqrt{R^2 + {X_L}^2}$$
$$\theta = \tan^{-1}\left[\frac{X_L}{R}\right]$$
$$Cos\ \theta = \frac{R}{Z}$$

### RC CIRCUIT

$$I = \frac{V}{Z}$$
$$V_C = IX_C$$
$$Z = \sqrt{R^2 + {X_C}^2}$$
$$\theta = \tan^{-1}\left[\frac{X_C}{R}\right]$$
$$Cos\ \theta = \frac{R}{Z}$$

### RLC CIRCUIT

$$I = \frac{V}{Z}$$
$$V_L = IX_L \quad V_C = IX_C \quad V_R = IR$$
$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$
$$\theta = \tan^{-1}\left[\frac{X_L - X_C}{R}\right]$$
$$Cos\ \theta = \frac{R}{Z}$$

### AC MACHINES

$$N_S = \frac{120f}{P} \qquad \%S = \frac{N_S - N_R}{N_S} \times 100$$
$$Nr = N_S(1 - S) \qquad fr = Sf$$
$$E = 2.22 K_d K_p f \theta Z$$

### TRANSFORMER

$$\frac{V_P}{V_S} = \frac{N_P}{N_S} = \frac{I_S}{I_P} \qquad E_1 = 4.44 f N_1 \Phi_m \qquad E_2 = 4.44 f N_2 \Phi_m$$

$Complex\ Power, S(VA) = VI$

$Actual\ Power, P(W) = VI \cos\theta$

$\text{Re}\ active\ Power, Q(VAR) = VI \sin\theta$

$$I = \frac{Power}{Voltage}$$

$Power\ losses = Core\ lossess + {I_P}^2 R_P + {I_S}^2 R_S$

$Output\ Power = Power \times power\ factor$

$Input\ Power = Output\ power + power losses$

$$Efficiency, \%\eta = \frac{output\ power}{input\ power} \times 100$$

### ELECTROMAGNET

$$H = \frac{Fm}{l} = \frac{NI}{l}$$
$$B = \frac{\Phi}{A}$$
$$B = \mu H$$
$$\mu = \mu_o \mu_r$$
$$S = \frac{Fm}{\Phi} = \frac{l}{\mu A}$$