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

DJJ20263: ELECTRICAL AND ELECTRONIC TECHNOLOGY

TARIKH : 10 DISEMBER 2025
MASA : 11.30 PAGI - 01.30 PETANG (2 JAM)

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

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

INSTRUCTION:

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

ARAHAN:

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

QUESTION 1

SOALAN 1

CLO1 (a) List **FOUR (4)** factors that influence the value of resistance.

*Senaraikan **EMPAT (4)** faktor mempengaruhi nilai rintangan.*

[4 marks]

[*4 markah*]

CLO1 (b) Compare the 3Φ and 1Φ systems in terms of colour coded cables, waveforms and applications.

Bandingkan sistem 3 Φ dan 1 Φ dari segi warna kod kabel, gambarajah gelombang dan aplikasi.

[6 marks]

[*6 markah*]

CLO1

(c) Refer to the Figure 1(c) below and solve the following:
Rujuk Rajah 1 (c) di bawah dan selesaikan yang berikut :

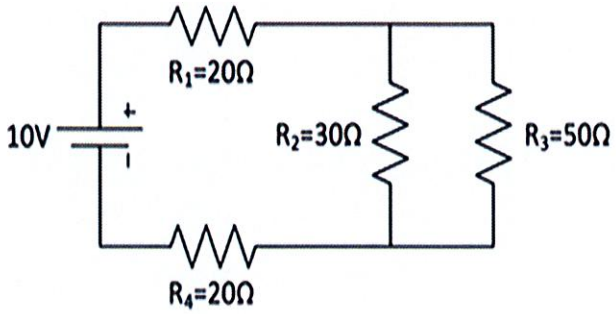

Figure 1(c) / *Rajah 1(c)*

i. Total resistance, R_T
Jumlah rintangan, R_T [5 marks]
[*5 markah*]

ii. Total current, I_T
Jumlah Arus, I_T
[3 marks]
[3 markah]

iii. Current at resistor R_2, I_{R2}
Arus pada perintang R_2, I_{R2}
[3 marks]
[*3 markah*]

iv. Current at resistor R_3, I_{R3}
Arus pada perintang R_3, I_{R3}
[2 marks]
[*2 markah*]

v. Voltage drop at R_4 ,
Voltan jatuh pada R_4
[2 marks]
[*2 markah*]

QUESTION 2

SOALAN 2

CLO1 (a) List **FOUR (4)** factors that affect the electromagnetic strength.

*Senaraikan **EMPAT (4)** faktor mempengaruhi kekuatan elektromagnet*

[4 marks]

[*4 markah*]

CLO1 (b) Visualize the magnetic field when two currents carrying conductors are put nearby.

Lukiskan medan magnet apabila dua konduktor berarus diletakkan berdekatan.

[8 marks]

[*8 markah*]

CLO1 (c) A loop shaped of a mild steel has length of 40 cm and cross- sectional area of 2 cm^2. It is wound with 1000 turns and 4A current flows through it. Relative permeability $\mu_r = 1200$. Calculate the following:

Sebuah gelung berbentuk litar terbuat daripada besi lembut mempunyai panjang 40 cm dan luas keratan rentas 2 cm^2. Gelung tersebut dililit sebanyak 1000 lilitan dan arus 4A mengalir melaluinya. Kebolehtelapan relatif bahan ialah $\mu_r = 1200$. Hitungkan nilai bagi perkara berikut :

i. Magnetomotive force, Fm

Daya gerak magnet, Fm

[2 marks]

[*2 markah*]

ii. Magnetic field strength, H

Kekuatan medan magnet, H

[2 marks]

[*2 markah*]

iii. Absolute permeability, μ

Kebolehtelapan mutlak, μ

[2 marks]

[*2 markah*]

iv. Flux density, B

Ketumpatan fluks magnet, B

[2 marks]

[*2 markah*]

v. The value of flux, Φ

Nilai fluks magnet, Φ

[2 marks]

[*2 markah*]

vi. The reluctance, S

Engganan magnet, S

[3 marks]

[3 markah]

QUESTION 3

SOALAN 3

CLO1 (a) State **TWO (2) differences** between a DC motor and an AC motor.
Nyatakan DUA (2) perbezaan antara motor AT dan motor AU.

[4 marks]
[4 *markah*]

CLO1 (b) Explain how a DC motor converts electrical energy into mechanical energy.
Terangkan bagaimana motor AT menukarkan tenaga elektrik kepada tenaga mekanikal.

[6 marks]
[*6 markah*]

CLO1 (c) A 4-pole, 50 Hz three-phase induction motor is operating under the following conditions, calculate:
Sebuah motor peraruh 4-kutub, 50 Hz beroperasi di bawah keadaan berikut, kirakan:

i. The synchronous speed, Ns
Kelajuan segerak, Ns

[3 marks]
[*3 markah*]

ii. The percentage slip if the rotor runs at 1440 rpm under load
Peratus gelinciran sekiranya rotor begerak dengan kelajuan 1440rpm di bawah beban

[3 marks]
[3 *markah*]

iii. The rotor frequency at this operating point.
Frekuensi rotor pada titik operasi ini

[2 marks]
[*2 markah*]

iv. The new rotor speed Nr if the slip increases to 6%,

Nilai kelajuan rotor yang baru sekiranya gelinciran meningkat kepada 6%,

[3 marks]

[3 *markah*]

v. The new stator frequency

Frekuensi stator yang baru.

[4 marks]

[4 *markah*]

QUESTION 4

SOALAN 4

CLO1

(a) Define an open-loop and closed-loop control system with **ONE (1)** example.
Takrifkan gegelung terbuka dan gegelung tertutup system kawalan dan ***SATU (1)*** *contoh.*

[4 marks]
[4 *markah*]

CLO1

(b) i. Explain **ONE (1)** type of sensors and **ONE (1)** application.
Terangkan ***SATU (1)*** *jenis pengesan dan* ***SATU (1)*** *aplilkasi.*

[4 marks]
[4 *markah*]

ii. Explain the working principle of transducers and its application.
Terangkan prinsip kerja transducer dan aplikasinya.

[4 marks]
[4 *markah*]

CLO1

(c)

i. The Figure 4(c) below shows a logic circuit and its incomplete truth table. Complete the Truth Table below.

Rajah 4(c) di bawah menunjukkan litar logik dan jadual kebenaran yang belum lengkap. Lengkapkan Jadual Kebenaran tersebut.

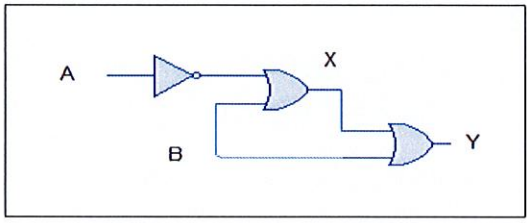

Figure 4 (c) / *Rajah 4 (c)*

A	B	X	Y
0	0		
0	1		
1	0		
1	1		

[4 marks]

[4 *markah*]

CLO1

ii. The output Y of the logic circuit is given by the Boolean expression (eq. 4.1). Construct the truth table for the expression and construct the logic circuit diagram.

Keluaran Y untuk litar logic diberi oleh pernyataan Boolean (eq. 4.1). Lukiskan jadual kebenaran untuk pernyataan tersebut dan binakan rajah litar logik.

$$Y = (A + B) \bullet \vec{C} \quad \ldots\ldots\ldots\ldots \text{ eq 4.1}$$

[9 marks]

[9 *markah*]

SOALAN TAMAT

POLITEKNIK MALAYSIA

DJJ20263 – ELECTRICAL AND ELECTRONIC TECHNOLOGY

FORMULA

Introduction to Electrical and Electronic

$V = IR \qquad P = IV \qquad E = Pt \qquad Q = CV$

Series Circuit

$$R_T = R_1 + R_2 + R_3 + \cdots R_n$$

$$V_T = V_1 + V_2 + V_3 + \cdots V_n$$

$$I_T = I_1 = I_2 = I_3 = \cdots = I_n$$

Voltage Divider Law

$$V_X = \left(\frac{R_X}{R_T}\right) V_T$$

Parallel Circuit

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \cdots \frac{1}{R_n} \quad \text{or}$$

$$R_T = \frac{R_1 R_2 R_3}{R_2 R_3 + R_1 R_3 + R_1 R_2}$$

$$V_T = V_1 = V_2 = I_3 = \cdots = V_n$$

$$I_T = I_1 + I_2 + I_3 + \cdots I_n$$

Current Divider Law

$$I_x = \left(\frac{R_T}{R_X}\right) I_T$$

Electromagnetism and Electrostatic

Electromagnetism

$\Phi = B\,x\,A \qquad B = \frac{\Phi}{A} \qquad B = \mu H$

$F_M = NI \qquad H = \frac{F_M}{l}$

$\mu = \mu_0\,\mu_r \qquad \mu = \frac{B}{H} \qquad \mu_0\,\mu_r = \frac{B}{H}$

$S = \frac{F_M}{\Phi} \qquad S = \frac{l}{\mu H} \qquad S = \frac{l}{\mu_0\,\mu_r A}$

Transformer

$$\frac{V_P}{V_S} = \frac{N_P}{N_S} = \frac{I_S}{I_P}$$

$E_P = 4.44 f N_P \Phi \qquad E_S = 4.44 f N_S \Phi$

Inductor

$$E = \frac{1}{2} LI^2$$

Series inductor

$$L_T = L_1 + L_2 + L_3 + \cdots L_n$$

Parallel inductor

$$\frac{1}{L_T} = \frac{1}{L_1} + \frac{1}{L_2} + \frac{1}{L_3} + \cdots \frac{1}{L_n}$$

Capacitor

$$E = \frac{1}{2} QV$$

Series capacitor

$$\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \cdots \frac{1}{C_n}$$

Parallel capacitor

$$C_T = C_1 + C_2 + C_3 + \cdots C_n$$

Motor and Generator

$N_S = \frac{120f}{P} \qquad N_r = N_S\,(1 - S)$

$S = \frac{N_S - N_r}{N_S} \qquad \%S = \frac{N_S - N_r}{N_S}\ x\ 100\%$

$f_r = S\,x\,f$

$f = f_r + f_S$

Automation Control System

Boolean Expression

AND Gate: Y=A·B (A AND B)

OR Gate: Y=A+B (A OR B)

NOT Gate: Y=A (NOT A)

NAND Gate: Y=A·B (NOT (A AND B))

NOR Gate: Y=A+B (NOT (A OR B))

XOR Gate: Y=A⊕B (A XOR B)

XNOR Gate: Y=A⊕B (NOT (A XOR B))