KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

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

JABATAN KEJURUTERAAN PETROKIMIA

PEPERIKSAAN AKHIR

SESI I : 2025/2026

DGP10283 : ELECTRICAL TECHNOLOGY

TARIKH : 24 NOVEMBER 2025
MASA : 2:30 PETANG – 4:30 PETANG (2 JAM)

Kertas ini mengandungi **TUJUH (7)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

INSTRUCTION:

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

ARAHAN:

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

QUESTION 1

SOALAN 1

CLO1 (a) Describe the electromotive force (e.m.f) including the symbol and unit.

Huraikan daya gerak elektrik (d.g.e) termasuk simbol dan unit.

[4 marks]

[*4 markah*]

CLO1 (b) Based on circuit in Figure 1(b),

Berdasarkan kepada litar di Rajah 1(b),

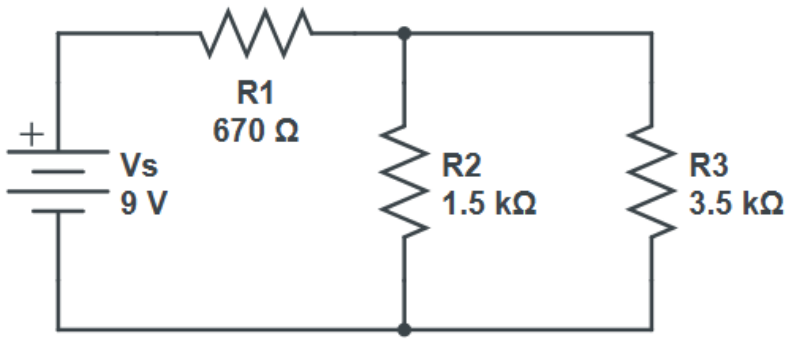

Figure 1(b)

Rajah 1(b)

i. express type of the circuit.

tunjukkan jenis litar tersebut.

[2 marks]

[*2 markah*]

ii. approximate the value of total resistance, R_T.
anggarkan nilai kerintangan total, R_T.

[4 marks]
[*4 markah*]

iii. approximate the value of total current, I_T.
anggarkan nilai arus total, I_T.

[2 marks]
[*2 markah*]

CLO1 (c) Calculate $\mathbf{I_1}$, $\mathbf{I_2}$ and $\mathbf{I_3}$ for the circuit in Figure 1(c) below using Kirchoff's Law.
Kira nilai $\boldsymbol{I_1}$, $\boldsymbol{I_2}$ *and* $\boldsymbol{I_3}$ *bagi litar dalam Rajah 1(c) di bawah dengan menggunakan Hukum Kirchoff.*

[13 marks]
[*13 markah*]

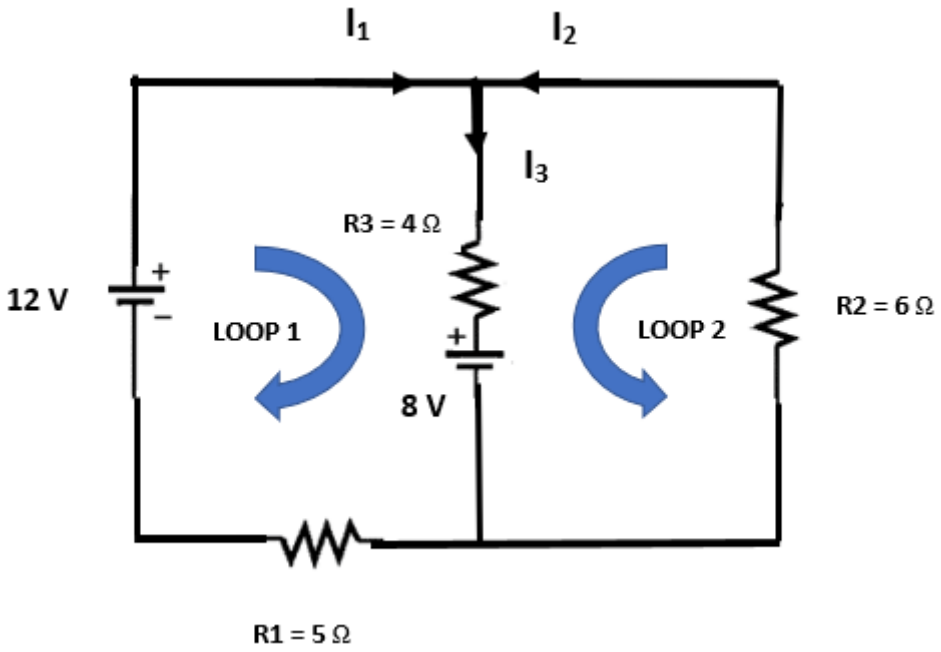

Figure 1(c)
Rajah 1(c)

QUESTION 2

SOALAN 2

CLO1 (a) Define Capacitance.

Takrifkan Kapasitan.

[3 marks]

[*3 markah*]

CLO1 (b) There are three capacitors with value of 100µF, 550µF and 1mF.

i. Approximate the total capacitance, C_T if all the capacitors are connected in parallel.

Anggarkan jumlah kapasitan, C_T *jika semua kapasitor disambung secara selari.*

[5 marks]

[*5 markah*]

ii. Approximate the total capacitance, C_T if all the capacitors are connected in series.

Anggarkan jumlah kapasitan, C_T *jika semua kapasitor disambung secara sesiri.*

[6 marks]

[*6 markah*]

CLO1 (c) A series of RLC circuit with a resistance of 500Ω, inductance of 350mH and capacitance of 90µF is connected to a 200V, 50Hz AC supply.

Sebuah litar sesiri RLC berintangan 500Ω, berkearuhan 350mH dan berkemuatan 90µF disambungkan kepada satu bekalan kuasa AT 200V, 50Hz.

i. Calculate circuit impedance, Z and current, I.

Kira galangan litar, Z *dan arus,* I.

[8 marks]

[*8 markah*]

ii. Sketch the impedance triangle with complete label.

Lakarkan segitiga galangan dengan label yang lengkap.

[3 marks]

[*3 markah*]

QUESTION 3

SOALAN 3

CLO1 (a) Direction of the magnetic field produced by the current in a solenoid can be determined using 2 methods. State these **TWO (2)** methods.

*Arah medan magnet yang dijanakan oleh arus dalam sesuatu geglung boleh ditentukan menggunakan dua kaedah. Nyatakan **DUA (2)** kaedah ini.*

[4 marks]
[*4 markah*]

CLO1 (b) Explain the electromagnetic effects when using **TWO (2)** conductors with the aid of a suitable diagram.

*Jelaskan kesan elektromagnetik apabila menggunakan **DUA (2)** pengalir dengan menggunakan gambar rajah yang sesuai.*

[9 marks]
[*9 markah*]

CLO1 (c) Part of a magnetic circuit is made of steel with a length of 120cm, a cross sectional area of $60cm^2$ and a Relative Permeability, μ_r of 870. Given that the Total Magnetic Flux, ø is 900μWb,

Sebahagian daripada litar magnet diperbuat daripada keluli dengan panjang 120cm, luas keratan rentas $60cm^2$ dan Kebolehtelapan Relatif 870. Diberi Jumlah Fluks Magnet ialah 900μWb,

i. calculate the Absolute Permeability, μ_o.
kira Kebolehtelapan Mutlak, μ_o.

[3 marks]
[*3 markah*]

ii. calculate the Reluctance, S.
kira Keengganan, S.

[5 marks]
[*5 markah*]

iii. calculate the Magnetomotive, F_m.
kira Ketumpatan Fluks, F_m.

[4 marks]
[*4 markah*]

QUESTION 4

SOALAN 4

CLO1 (a) Define the term of step-up transformer with the aid of a transformer diagram.
Takrifkan istilah pengubah langkah naik dengan bantuan gambar rajah pengubah.

[4 marks]
[*4 markah*]

CLO1 (b) A transformer construction consists of the primary and secondary windings which are connected by a magnetic core. Explain the basic construction of the transformer with the aid of a diagram.
Binaan pengubah terdiri daripada gegelung primer dan gegelung sekunder yang dihubungkan oleh teras magnet. Terangkan binaan asas suatu pengubah dengan bantuan gambar rajah.

[10 marks]
[*10 markah*]

CLO1 (c) A 100kVA, 200V/1000V, 50 Hz single-phase transformer has 100 primary turns. Calculate:
Sebuah pengubah fasa tunggal 100kVA, 200V/1000V, 50 Hz mempunyai 100 lilitan di gegelung primer. Kira:

i. the current at primary winding, I_p and secondary winding, I_s.
arus di gegelung primer, I_p *dan gegelung sekunder,* I_s.

[6 marks]
[*6 markah*]

ii. the number of secondary turns, N_s.
bilangan lilitan gegelung sekunder, N_s.

[3 marks]
[*3 markah*]

iii. the expected ratio, K.
nisbah terjangka, K.

[2 marks]
[*2 markah*]

SOALAN TAMAT

Formula for Basic Electrical Principles

Ohms Law:

$$V = IR \; or \; I = \frac{V}{R} \; or \; R = \frac{V}{I}$$

Charge: $Q = It$

Resistivity:

$$R = \frac{\rho l}{A} \; or \; \mathrm{R} = \mathrm{k}\frac{1}{A} \; or \; R = kl$$

Power:

$$P = I^2R \quad or \quad P = IV \quad or \quad P = \frac{V^2}{R}$$

Electrical Energy: $E = Pt$

Resistance:

Series: $R_T = R_1 + R_2 + \cdots + R_N$

Parallel:

$$R_T = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \cdots . + \frac{1}{R_N}}$$

Parallel 2 branches:

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

Voltage divider rule (VDR):

$$V_N = \left(\frac{R_N}{R_T}\right) V_T$$

Current divider rule (CDR):

$$I_N = \left(\frac{R_T}{R_N}\right) I_T$$

Current divider rule for 2 branches:

$$I_1 = \left(\frac{R_2}{R_1 + R_2}\right) I_T \; or \; I_2 = \left(\frac{R_1}{R_1 + R_2}\right) I_T$$

Charge on capacitor:

$$Q = CV \quad or \quad C = \frac{Q}{V} \quad or \quad V = \frac{Q}{C}$$

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

Capacitor in series:

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

Capacitor in parallel:

$$C_T = C_1 + C_2 + \cdots + C_N$$

Inductor in series:

$$L_T = L_1 + L_2 + \cdots + L_N$$

Inductor in parallel:

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

Capacitive Reactance, X_C:

$$\mathrm{X_C} = \frac{1}{2\pi \mathrm{fC}}$$

Inductive Reactance, X_L:

$$\mathrm{X_L} = 2\pi \mathrm{fL}$$

R-C series:

$$\mathrm{Z} = \sqrt{\mathrm{R}^2 + \mathrm{X_C}^2} \; , \quad \mathrm{V} = \mathrm{IZ}$$

R-L series:

$$\mathrm{Z} = \sqrt{\mathrm{R}^2 + \mathrm{X_L}^2} \; , \quad \mathrm{V} = \mathrm{IZ}$$

R-L-C series:

$$\mathrm{Z} = \sqrt{\mathrm{R}^2 + (\mathrm{X_C} - \mathrm{X_L})^2} \; , \quad \mathrm{V} = \mathrm{IZ}$$

$$\mathrm{Z} = \sqrt{\mathrm{R}^2 + (\mathrm{X_L} - \mathrm{X_C})^2} \; , \quad \mathrm{V} = \mathrm{IZ}$$

Electromagnetic induction:

$$\mathrm{E} = \mathrm{Blv}\sin\theta$$

$$\mathrm{F_m} = \mathrm{H}l \; , \; \mathrm{F_m} = \mathrm{IN} \; , \; \mathrm{F_m} = \mathrm{S}\emptyset$$

$$\mathrm{B} = \frac{\emptyset}{A} \; , \qquad \mu = \mu_o \mu_r \; , \qquad \mu = \frac{B}{H}$$

$$\mathrm{S} = \frac{F_m}{\emptyset} = \frac{Hl}{BA} = \frac{l}{\left(\frac{B}{H}\right)A} = \frac{l}{\mu_o \mu_r A}$$

Transformer:

$$\frac{N_2}{N_1} = \frac{V_2}{V_1} \; or \; \frac{V_1}{V_2} = \frac{N_1}{N_2}$$

$$\frac{V_1}{V_2} = \frac{N_1}{N_2} = \frac{I_2}{I_1}$$

$$\mathrm{S} = V_1 \mathrm{I}_1 = V_2 \mathrm{I}_2$$

$$K = \frac{N_S}{N_P} = \frac{E_S}{E_P} = \frac{V_S}{V_P}$$