KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

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

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR

SESI II : 2025/2026

DET20123 : ELECTRICAL CIRCUITS 2

TARIKH : 13 MEI 2026
MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas soalan ini mengandungi **ENAM (6)** halaman bercetak.
Bahagian A: Struktur (4 soalan)
Bahagian B: Esei (1 soalan)
Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

TERBUKA

SECTION A: 80 MARKS

BAHAGIAN A: 80 MARKAH

INSTRUCTION:

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

ARAHAN:

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

QUESTION 1

SOALAN 1

CLO1 a) State **TWO (2)** differences between direct current (DC) and alternating current (AC).

*Nyatakan **DUA (2)** perbezaan antara arus terus (AT) dan arus ulang alik (AU).*

[4 marks]

[*4 markah*]

CLO1 b) Referring to Figure A1(b), fill up the label for the parts of the AC generator.
Merujuk kepada Rajah A1(b), isikan label bagi setiap bahagian dalam penjana AU.

[6 marks]

[6 *markah*]

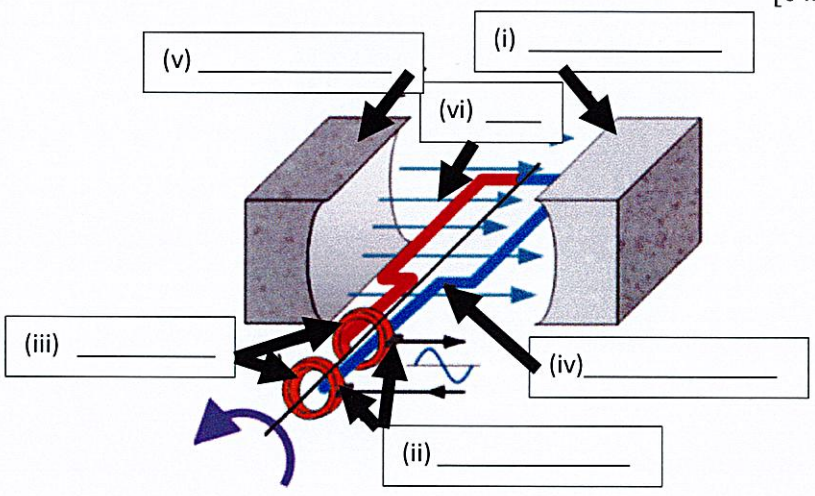

Figure A1(b) / *Rajah A1(b)*

CLO1 c) Given an alternating current voltage is V = 15 sin(314t – 0.45) V. Calculate the peak-to-peak voltage, frequency, period, phase shift in degrees and the value of the voltage at t = 0.1 ms.

Diberi voltan arus ulang alik ialah V = 15 sin(314t – 0.45). Kirakan voltan puncak ke puncak, frekuensi, masa, beza fasa dalam darjah dan nilai voltan ketika t = 0.1 ms.

[10 marks]

[*10 markah*]

QUESTION 2

SOALAN 2

CLO1 a) With the aid of a diagram, outline the relationship between voltage and current in a purely capacitive AC circuit.

Dengan bantuan gambarajah, bincangan hubungan antara voltan dan arus untuk litar kapasitor tulen.

[5 marks]

[*5 markah*]

CLO1 b) Elaborate an impedance triangle for RL and RC series circuit using the suitable diagram.

Terangkan segitiga galangan bagi litar sesiri RL dan RC menggunakan rajah yang sesuai.

[5 marks]

[*5 markah*]

CLO1 c) A coil of inductance 70mH is connected in series with a capacitance of 12uF and a resistance of 40Ω across a 110V, variable-frequency AC supply. Calculate the resonant frequency, Q factor, bandwidth of the circuit, current flow and the voltage drops at inductance during the resonance.

Satu gegelung aruhan 70mH disambungkan secara sesiri dengan kapasitor 12uF dan rintangan 40Ω merentasi bekalan 110V, frekuensi boleh ubah. Kirakan frekuensi resonan, faktor Q, jalur lebar litar, arus mengalir dan kejatuhan voltan pada induktif ketika resonan.

[10 marks]

[*10 markah*]

QUESTION 3

SOALAN 3

CLO1 a) Describe the primary winding and secondary winding in the construction of a transformer.

Huraikan lilitan primer dan lilitan sekunder dalam pembinaan pengubah.

[4 marks]

[*4 markah*]

CLO1 b) Explain briefly the characteristics of a step-down transformer.

Terangkan secara ringkas ciri-ciri pengubah langkah turun.

[6 marks]

[*6 markah*]

CLO1 c) A 9kVA single-phase transformer with a turn ratio 1:10 is fed from a 200V supply. By neglecting losses, calculate the full-load secondary current, the load resistance and the primary current at full load in kVA.

Sebuah pengubah fasa tunggal 9KVA mempunyai nisbah lilitan 1:10 disuap daripada bekalan 200V. Dengan mengabaikan kehilangan, kirakan arus sekunder beban penuh, rintangan beban dan arus primer pada beban penuh dalam kVA.

[10 marks]

[*10 markah*]

QUESTION 4

SOALAN 4

CLO1 a) Discuss the effect of changing supply frequency on an RLC series circuit.
Bincangkan kesan perubahan frekuensi terhadap litar RLC sesiri.

[5 marks]
[*5 markah*]

CLO1 b) Discuss the STAR connection in a three-phase system.
Bincangkan sambungan STAR dalam sistem tiga fasa.

[5 marks]
[*5 markah*]

CLO1 c) A three-phase load is connected to 415V, 50Hz voltage supply. Each phase consists of 50Ω resistor connected in series with 200mH inductor in a DELTA Connection. Calculate the line current and the active power of the circuit.
Satu beban tiga fasa disambungkan dengan 415V, 50Hz bekalan voltan. Setiap fasa mengandungi 50Ω perintang yang disambungkan secara siri dengan 200mH inductor dalam Sambungan DELTA. Kirakan arus talian dan kuasa aktif pada litar.

[10 marks]
[*10 markah*]

SECTION B: 20 MARKS

BAHAGIAN B: 20 MARKAH

INSTRUCTION:

This section consists of **ONE (1)** essay question. Answer the question.

ARAHAN:

*Bahagian ini mengandungi **SATU (1)** soalan esei. Jawab soalan tersebut.*

QUESTION 1

SOALAN 1

CLO1 Referring to Figure B1, complete the power triangle using the values of active power, apparent power and reactive power.

Merujuk kepada Rajah B1, lengkapkan segitiga kuasa menggunakan nilai kuasa aktif, kuasa ketara dan kuasa reaktif.

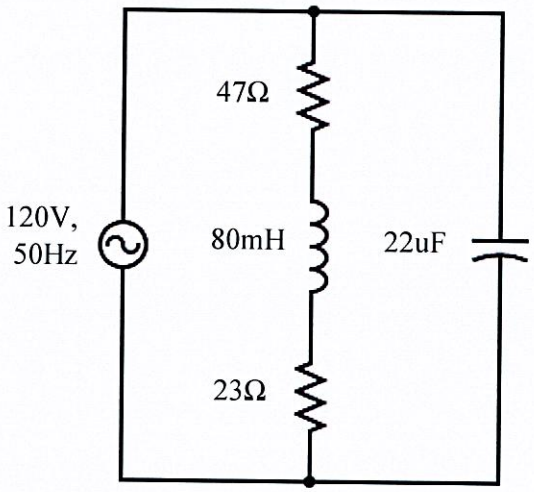

Figure B1 / *Rajah B1*

[20 marks]

[*20 markah*]

SOALAN TAMAT

SENARAI FORMULA

$V_P = \sqrt{2} \times V_{rms}$	$v(t) = V_P sin(\omega t \pm \theta)$	$X_L = 2\pi fL$
$I_P = \sqrt{2} \times I_{rms}$	$i(t) = I_P sin(\omega t \pm \theta)$	$X_C = \frac{1}{2\pi fC}$
$V_{PP} = 2V_P$	$Z_T = \sqrt{R^2 + X_{eq}^2}$ $if\ X_L > X_C;\ \ X_{eq} = X_L - X_C$ $if\ X_C > X_L;\ \ X_{eq} = X_C - X_L$	
$I_{PP} = 2I_P$	$S = IV$ $S = I^2Z$	$I_T = \frac{V_S}{Z_T}$
$V_{rms} = \frac{V_P}{\sqrt{2}}$	$P = IVcos\ \theta$ $P = I^2R$	$\theta = \cos^{-1} PF$
$I_{rms} = \frac{I_P}{\sqrt{2}}$	$Q = IVsin\ \theta$ $Q = I^2\lvert X_C - X_L\rvert$	$\theta = \tan^{-1}\left(\frac{X_C - X_L}{R}\right)$ $\theta = \tan^{-1}\left(\frac{V_C - V_L}{V_S}\right)$
$V_{ave} = \frac{2V_P}{\pi}$	$I_T = \sqrt{I_R^2 + (I_C - I_L)^2}$	$\cos\theta = \frac{R}{Z}$
$I_{ave} = \frac{2I_P}{\pi}$	$Z_T = \frac{V_S}{I_T}$	$V_R = IR$
$t = \frac{1}{f}$ $t = \frac{2\pi}{\omega}$	$\theta = \tan^{-1}\left(\frac{I_C - I_L}{I_R}\right)$	$V_L = IX_L$ $V_C = IX_C$
$f = \frac{1}{t}$ $f = \frac{\omega}{2\pi}$	$f_r = \frac{1}{2\pi}\sqrt{\frac{1}{LC} - \frac{R^2}{L^2}}$	$\boldsymbol{f_r = \frac{1}{2\pi\sqrt{LC}}}$
$Z_T = \sqrt{R^2 + X_{eq}^2} = \sqrt{R^2 + 0} = R$		$BW = f_H - f_L = \frac{f_r}{Q}$
$I_T = \frac{V_S}{R}$	$f_L = f_r - \frac{BW}{2}$	$f_H = f_r + \frac{BW}{2}$
$\theta = \tan^{-1}\left(\frac{X_C - X_L}{R}\right)$		$Q = \frac{X_L}{R} = \frac{f_r}{BW}$

$$\theta = \tan^{-1}\left(\frac{V_C - V_L}{V_S}\right)$$

$$\cos\theta = \frac{R}{Z} = \frac{R}{R} = 1$$

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

$$\boldsymbol{V_2 = \frac{N_2}{N_1} \times V_1}$$

$$\boldsymbol{V_2 = \frac{P_2}{I_2}}$$

$$Q = \frac{1}{R}\sqrt{\frac{L}{C}} = \frac{f_r}{BW}$$

$$V_1 = \frac{N_1}{N_2} \times V_2$$

$$V_1 = \frac{P_1}{I_1}$$

$$I_1 = \frac{N_2}{N_1} \times I_2$$

$$I_2 = \frac{V_2}{R_L}$$

$$S_1 = S_2$$

$$I_1 V_1 = I_2 V_2$$

$$Z_P = \sqrt{R^2 + X_{eq}^2}$$

$$if\ X_L > X_C;\quad X_{eq} = X_L - X_C$$

$$if\ X_C > X_L;\quad X_{eq} = X_C - X_L$$

$$P_1 = I_1 V_1$$

$$P_2 = I_2 V_2 \quad or \quad P_2 = I_2^2 R_L$$

$$P_1 = P_2$$

$$Z_P = \frac{V_P}{I_P}$$

$$V_L = V_{RY} = V_{YB} = V_{BR}$$

$$V_L = \sqrt{3}\, V_P$$

$$V_L = V_{RY} = V_{YB} = V_{BR}$$

$$V_L = V_P$$

$$S = 3\, I_P V_P$$

$$S = \sqrt{3}\, I_L V_L$$

$$V_P = V_R = V_Y = V_B$$

$$V_P = \frac{V_L}{\sqrt{3}}$$

$$V_P = V_L$$

$$P = 3\, I_P V_P \cos\theta$$

$$P = \sqrt{3}\, I_L V_L \cos\theta$$

$$\boldsymbol{I_P = \frac{V_P}{Z_P}}$$

$$\boldsymbol{I_P = \frac{I_L}{\sqrt{3}}}$$

$$\boldsymbol{I_L = \sqrt{3}\, I_P}$$