

SULIT



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

JABATAN KEJURUTERAAN MEKANIKAL

**PEPERIKSAAN AKHIR
SESI DISEMBER 2015**

DJJ2022 : ELECTRICAL TECHNOLOGY

**TARIKH : 08 APRIL 2016
MASA : 3.00 PM – 5.00 PM (2 JAM)**

Kertas ini mengandungi **LAPAN (8)** halaman bercetak.
Struktur (4 soalan)
Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

INSTRUCTIONS:

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

ARAHAN:

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

QUESTION 1**SOALAN 1**CLO1
C1

- (a) List
- FIVE (5)**
- basic electrical quantities and state the units.

Senaraikan LIMA (5) kuantiti- kuantiti asas elektrik dan nyatakan unit-unit berkenaan.

[5 marks]

[5 markah]

CLO1
C2

- (b) With reference to Figure 1(b), calculate the current flow in the conductor.

Merujuk kepada Rajah 1(b), kirakan arus yang mengalir melalui pengalir.

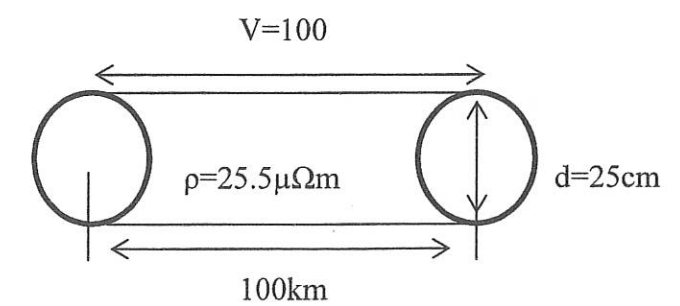


Figure 1(b) / Rajah 1(b)

[6 marks]

[6 markah]

CLO1
C4

(c) With reference to the combination circuit in Figure 1(c), calculate :

Merujuk kepada litar gabungan Rajah 1(c), kirakan :

- Total resistance, R_T
Jumlah rintangan, R_T
- Total current, I_T
Jumlah arus, I_T
- Voltage drop across resistor R_1 and R_2
Voltan yang susut pada rintangan R_1 dan R_2
- Total power, P_T
Jumlah kuasa, P_T

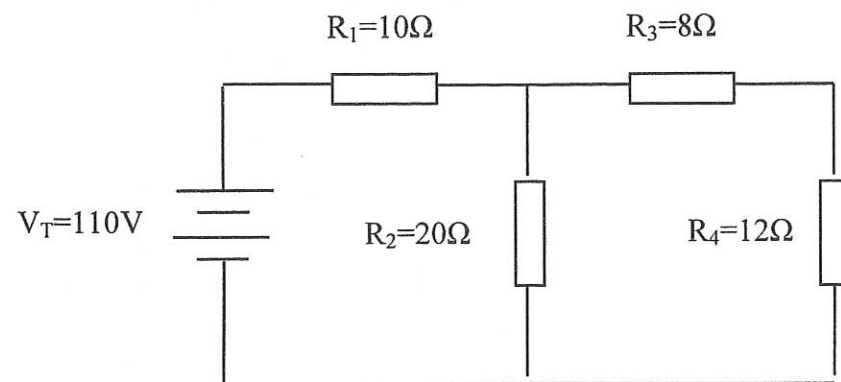


Figure 1(c) / Rajah 1(c)

[14 marks]

[14 markah]

QUESTION 2

SOALAN 2

CLO1
C1

- (a) A balance three wire, 3 phase with maximum load has a voltage of 415 V. Draw and label the three phase (3Φ) sinusoidal waveform.
Tiga wayar seimbang 3 fasa beban maksimum mempunyai voltan 415V. Lukis dan labelkan gelombang sinus 3 fasa tersebut.

[5 marks]

[5 markah]

CLO1
C2

- (b) Based on Figure 2(b), determine the total inductance, L_T between point A and B.
Berdasarkan Rajah 2(b), tentukan jumlah aruhan L_T di antara titik A dan B.

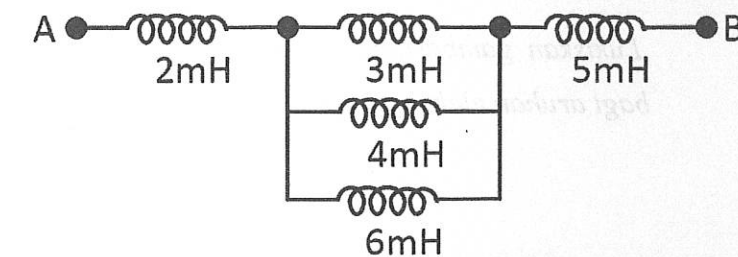


Figure 2(b) / Rajah 2(b)

[5 marks]

[5 markah]

CLO1
C4

- (c) An AC 240V, 50 Hz circuit is linked with a resistor, capacitor and inductor in series connection which contained the following values :
Resistance = 10Ω , Capacitance = $100 \mu\text{F}$, Inductance = 200 mH
Sketch and label the circuit and calculate :
*Sebuah litar arus ulang alik AU, 240 V, 50 Hz disambung secara sesiri dengan perintang, pemuat dan pearuh yang mempunyai nilai-nilai seperti berikut :
Perintang = 10Ω , Kemuatan = $100 \mu\text{F}$, Kearuhan = 200 mH
Lakar dan labelkan litar tersebut serta kirakan:*

- Impedance, Z
Galangan, Z

ii. Current, I
Arus, I

iii. Phase angle, θ
Sudut fasa, θ

[15 marks]

[15 markah]

QUESTION 3

SOALAN 3

CLO1
C2 (a) Draw a suitable diagram to illustrate Faraday's Law of electromagnetic induction
Lukiskan gambarajah yang bersesuaian, untuk menerangkan Hukum Faraday bagi aruhan elektromagnet

[12 marks]

[12 markah]

CLO1
C3 (b) A coil of 600 turns is wound uniformly on a ring of non-magnetic material. The ring has a mean circumference of 60cm and uniform cross sectional area of 10cm^2 . If the current in the coil is 2A and relative permeability is 1, calculate:
Satu gegelung yang mempunyai 600 lilitan dipasang seragam pada satu gelang tidak agnetik. Gelang tersebut mempunyai lilitan sebanyak 60cm dan keluasan rentas yang seragam banyak 10cm^2 . Jika arus pada gegelung adalah 2A dan ketelapan bandingan ialah 1, kirakan:

i. Magnetic field strength
Kekuatan medan magnet

[7 marks]

[7 markah]

ii. Flux Density
Ketumpatan fluks

[3 marks]

[3 markah]

iii. Total magnetic flux
Jumlah fluks magnetik

[3 marks]

[3 markah]

QUESTION 4

SOALAN 4

CLO1
C1 (a) Draw the construction of transformer
Lakarkan gambarajah binaan bagi pengubah

[5 marks]

[5 markah]

CLO1
C2 (b) Explain briefly TWO (2) basic parts of AC machine.
Terangkan secara ringkas DUA (2) binaan asas mesin AU.

[5 marks]

[5 markah]

CLO1
C3 (c) i. A 5 pole, 60 Hz induction motor is running on load with a slip of 5%. Calculate;
Sebuah motor aruhan 5 kutub, 60Hz di pacu pada beban penuh dengan 5% gelinciran, Kirakan;

a. the synchronous speed
kelajuan segerak

b. the actual speed
kelajuan sebenar

- c. the frequency of the rotor currents when the motor is starting and runs at full load
frekuensi arus pemutar apabila motor dihidupkan dan dipacu pada beban penuh.

[7 marks]

[7 markah]

- ii. A 280 kVA, 1400 V / 400 V, 53 Hz single-phase transformer has 180 turns on a secondary. Solve :

Sebuah pengubah satu fasa, 280 kVA, 1400 V/400V, 53 Hz mempunyai lilitan sekunder sebanyak 180 lilit. Selesaikan:

- a. The approximate values of the primary and secondary currents.
Arus pada lilitan prima dan lilitan sekunder

- b. The approximate number of primary turns.
Lilitan prima

[8 marks]

[8 markah]

SOALAN TAMAT

CLO1
C3



<p>INTRODUCTION TO ELECTRICAL CIRCUITS</p> $R = \frac{\rho l}{A} \quad V = IR$ $P = IV \quad E = Pt$ $C = \frac{Q}{V}$	<p>ALTERNATING CURRENT CIRCUIT</p> <p>RL CIRCUIT</p> $I = \frac{V}{Z}$ $V_L = IX_L$ $Z = \sqrt{R^2 + X_L^2}$ $\theta = \tan^{-1} \left[\frac{X_L}{R} \right]$ $\cos \theta = \frac{R}{Z}$	<p>AC MACHINES</p> $N_s = \frac{120f}{P} \quad \%S = \frac{N_s - N_r}{N_s} \times 100$ $N_r = N_s(1 - S) \quad f_r = Sf$
<p>KIRCHOFF'S LAW $V_1 = V_1 + V_2 + V_3$ $\Sigma I_{IN} = \Sigma I_{OUT}$ $I_1 = I_2 + I_3$</p>	<p>RC CIRCUIT</p> $I = \frac{V}{Z}$ $V_C = IX_C$ $Z = \sqrt{R^2 + X_C^2}$ $\theta = \tan^{-1} \left[\frac{X_C}{R} \right]$ $\cos \theta = \frac{R}{Z}$	<p>TRANSFORMER</p> $\frac{V_p}{V_s} = \frac{N_p}{N_s} = \frac{I_s}{I_p} \quad E_1 = 4.44 f N_1 \Phi_m$ $E_2 = 4.44 f N_2 \Phi_m$ <p>Complex Power, S (VA) = $\sqrt{3} V_L I_L$ Actual Power, P (W) = $\sqrt{3} V_L I_L \cos \theta$ Reactive Power, Q (VAR) = $\sqrt{3} V_L I_L \sin \theta$</p> <p>I = $\frac{\text{Power}}{\text{Voltage}}$</p> <p>Power losses = Core losses + $I_p^2 R_p$ + $I_s^2 R_s$ Output power = Power x power factor Input power = output power + power losses Efficiency, %η = $\frac{\text{output power}}{\text{Input power}} \times 100$</p>
<p>SERIES</p> $V_T = V_1 + V_2 + \dots + V_n$ $I_T = I_1 = I_2 = \dots = I_n$ $R_T = R_1 + R_2 + \dots + R_n$ $L_T = L_1 + L_2 + \dots + L_n$ $\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \dots + \frac{1}{C_n}$	<p>RLC CIRCUIT</p> $I = \frac{V}{Z}$ $V_L = IX_L \quad V_R = IR$ $V_C = IX_C$ $Z = \sqrt{R^2 + (X_L - X_C)^2}$ $\theta = \tan^{-1} \left[\frac{X_L - X_C}{R} \right]$ $\cos \theta = \frac{R}{Z}$	<p>ELECTROMAGNET</p> $H = \frac{Fm}{l} = \frac{NI}{l}$ $B = \frac{\Phi}{A}$ $B = \mu H$ $\mu = \mu_0 \mu_r$ $S = \frac{Fm}{\Phi} @ \frac{l}{\mu A}$
<p>PARALLEL</p> $V_T = V_1 = V_2 = \dots = V_n$ $I_T = I_1 + I_2 + \dots + I_n$ $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \dots + \frac{1}{R_n}$ $\frac{1}{L_T} = \frac{1}{L_1} + \frac{1}{L_2} + \dots + \frac{1}{L_n}$ $C_T = C_1 + C_2 + \dots + C_n$		