SULIT

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

JABATAN KEJURUTERAAN MEKANIKAL

PENILAIAN ALTERNATIF

SESI 1 : 2021/2022

DJJ20053 : ELECTRICAL TECHNOLOGY

NAMA PENYELARAS KURSUS : MOHD FAUZI BIN DERANI

KAEDAH PENILAIAN : PEPERIKSAAN ATAS TALIAN

JENIS PENILAIAN : SOALAN ESEI BERSTRUKTUR (2 SOALAN)

TARIKH PENILAIAN : 28 JANUARI 2022

TEMPOH PENILAIAN : 2 JAM

LARANGAN TERHADAP PLAGIARISM (AKTA 174)
PELAJAR TIDAK BOLEH MEMPLAGIAT APA-APA IDEA, PENULISAN, DATA ATAU CIPTAAN ORANG LAIN. PLAGIAT ADALAH SALAH SATU PENYELEWENGAN AKADEMIK. SEKIRANYA PELAJAR DIBUKTIKAN MELAKUKAN PLAGIARISM, PENILAIAN BAGI KURSUS BERKENAAN AKAN DIMANSUHKAN DAN DIBERI GRED F DENGAN NILAI MATA 0.
(RUJUK BUKU ARAHAN-ARAHAN PEPERIKSAAN DAN KAEDAH PENILAIAN (Diploma) EDISI 6, JUN 2019, KLAUSA 17.3)

INSTRUCTIONS :
This section consists of **TWO (2)** structured essay questions. Answer **ALL** questions.

ARAHAN :

*Bahagian ini mengandungi **DUA (2)** soalan esei berstruktur. Jawab **SEMUA** soalan.*

QUESTION 1

SOALAN 1

CLO1 (C1)

(a) Describe clearly with diagrams TWO (2) types of electrical circuits

Terangkan secara jelas dengan gambarajah DUA (2) jenis litar elektrik

[4 marks]
[*4 markah*]

CLO2 (C2)

(b) Refer to Figure (1), express;

Merujuk kepada Rajah (1), nyatakan;

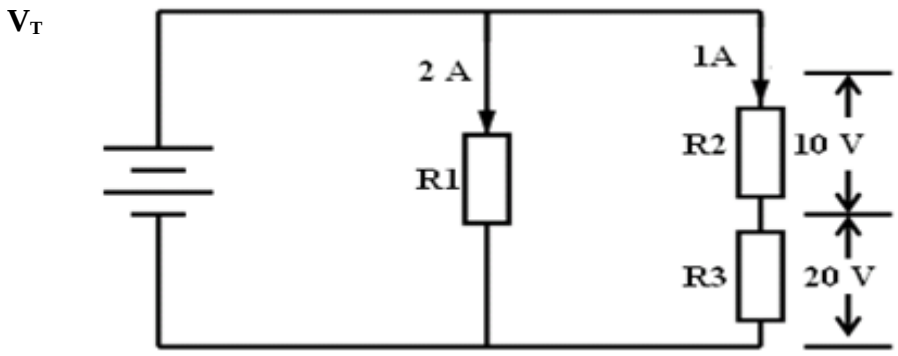

Figure (1)/ *Rajah (1)*

i. Total voltage, V_T

Voltan jumlah, V_T

[1 marks]
[*1 markah*]

ii. Drop voltages each resistor, V_{R1} & V_{R2}

Kejatuhan voltan pada setiap perintang, V_{R1} & V_{R2}

[2 marks]
[*2 markah*]

iii. Value of R_1, R_2 & R_T

Nilai perintang R_1, R_2 & R_T

[3 marks]
[*3 markah*]

iv. Power dissipated by resistor R_1 & R_2

Kuasa yang dilesapkan oleh perintang R_1 & R_2

[2 marks]
[*2 markah*]

CLO2
(C3)

(c) A series circuit consists of resistance of 40Ω, inductance of 300mH and capacitance of 450μF. This circuit is connected to 150V, 65Hz. Calculate;

Suatu litar sesiri mengandungi perintang 40Ω, pearuh 300mH dan pemuat 450μF. Bekalan kuasa 150V, 65Hz disambungkan kepada litar tersebut. Kirakan;

i. Impedance, Z

Galangan, Z

[4 marks]
[*4 markah*]

ii. Current flows in the circuit, I

Arus yang mengalir dalam litar, I

[2 marks]
[*2 markah*]

iii. Phase angle, Θ

Sudut fasa, Θ

[3 marks]
[*3 markah*]

iv. Real Power, P and Reactive Power, Q

Kuasa sebenar, P dan Kuasa Reaktif, Q

[4 marks]
[*4 markah*]

QUESTION 2
SOALAN 2

CLO 1 (C2)

a) Explain THREE (3) factors that affect magnetic field strength.
Terangkan TIGA (3) faktor yang mempengaruhi kekuatan medan magnet

[6 marks]
[*6 markah*]

CLO2 (C2)

b) The primary and secondary windings of a 350 kVA transformer have resistances of 0.5 Ω and 0.002 Ω respectively. The primary and secondary voltages are 10 kV and 200 V and the core loss is 3.2 kW, assuming the power factor of the load to be 0.75. Approximate the efficiency on full load.
Lilitan primer dan sekunder bagi sebuah pengubah 350 kVA mempunyai rinntangan bernilai 0.5 Ω dan 0.002 Ω. Voltan primer dan sekunder masing-masing bernila 10kV dan 200V, kehilangan teras besi sebanyak 3.2kW dan nilai factor kuasa ialah 0.75. Anggarkan kecekapan ketika beban penuh

[7 marks]
[*7 markah*]

CLO2 (C3)

(c) A 4 pole, 3 phase 240V, 55Hz induction motor runs at 1500 rev/min at full load. Calculate
Sebuah motor aruhan tiga fasa 4 kutub berputar pada kelajuan 1500 psm dengan bekalan kuasa 240V, 55Hz. Kirakan

i. Synchronous speed, Ns
Kelajuan segerak, Ns

[3 marks]
[*3 markah*]

ii. Percent slip
Peratus gelincir

[3 marks]
[*3 markah*]

iii. Rotor frequency, fr

Frekuensi rotor, fr

[3 marks]
[*3 markah*]

iv. Slip frequency, fs

Frekuensi gelincir, fs

[3 marks]
[*3 markah*]

SOALAN TAMAT

TABLE OF FORMULA

INTRODUCTION TO ELECTRICAL CIRCUITS

$$R = \frac{\rho \ell}{A} \qquad V = IR$$

$$P = IV \qquad E = Pt$$

$$C = \frac{Q}{V}$$

KIRCHOFF'S LAW

$V_1 = V_1 + V_2 + V_3$

$\Sigma I_{IN} = \Sigma I_{OUT}$

$I_1 = I_2 + I_3$

SERIES

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

PARALLEL

$V_T = V_1 = V_2 = \ldots\ldots = Vn$
$I_T = I_1 + I_2 + \ldots\ldots\ldots + I_n$
$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots\ldots + \frac{1}{R_n}$
$\frac{1}{L_T} = \frac{1}{L_1} + \frac{1}{L_2} + \ldots\ldots + \frac{1}{L_n}$
$C_T = C_1 + C_2 + \ldots\ldots + C_n$
$Ix = \frac{R_T}{R_x} I_T$

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

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

AC MACHINES

$$N_s = \frac{120f}{P} \qquad \%S = \frac{N_s - N_r}{N_s} \times 100$$

$$N_r = Ns(1 - S) \qquad f_r = Sf$$

$$E = 2.22 K_d K_p f \phi Z$$

TRANSFORMER

$$\frac{V_p}{V_s} = \frac{N_p}{N_s} = \frac{I_s}{I_p} \qquad E_1 = 4.44 f N_1 \Phi_m$$

$$E_2 = 4.44 f N_2 \Phi_m$$

Complex Power, S (VA) = VI

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

Reactive Power,Q (VAR) = $VI \sin\theta$

I = Power / Voltage

Power losses = Core losses + $Ip^2Rp + Is^2Rs$

Output power = Power x power factor

Input power = output power + power losses

Efficiency,%η = output power / Input power x 100

ELECTROMAGNET

$$H = \frac{Fm}{l} = \frac{NI}{l}$$

$$B = \frac{\Phi}{A}$$

$$B = \mu H$$

$$\mu = \mu_o \mu_r$$

$$S = \frac{Fm}{\Phi} @ \frac{l}{\mu A}$$