SULIT

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

JABATAN KEJURUTERAAN MEKANIKAL

PENILAIAN ALTERNATIF

SESI DISEMBER 2020

DJJ20053 / DJJ2022 : ELECTRICAL TECHNOLOGY

NAMA PENYELARAS KURSUS : MOHD FAUZI BIN DERANI

KAEDAH PENILAIAN : PEPERIKSAAN ONLINE

JENIS PENILAIAN : SOALAN ESEI BERSTRUKTUR (2 SOALAN)

TARIKH PENILAIAN : 9 JULAI 2021

TEMPOH PENILAIAN : 1 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)

INSTRUCTION :
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

DJJ20053
CLO2 (C3)

DJJ2022
CLO1 (C3)

(a) Refer to Figure (1), total current flow in the circuit is, I_T = 16.8mA. Calculate;
Merujuk kepada Rajah (1), jumlah arus mengalir pada litar ialah I_T = 16.8mA. Kirakan;

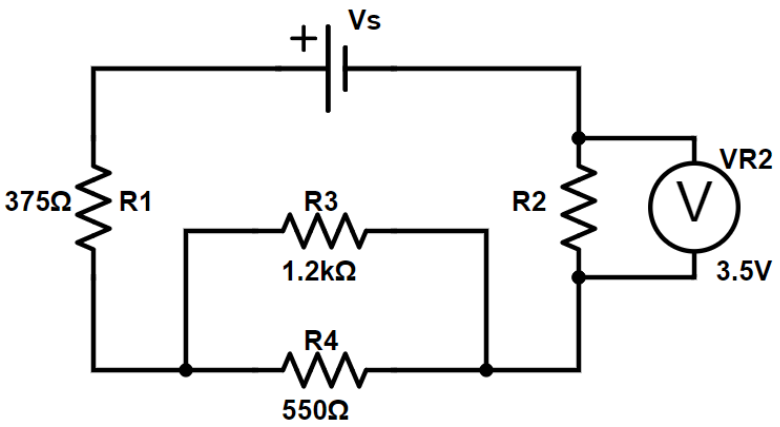

Figure (1)/ *Rajah (1)*

i. Value of resistor R2
Nilai perintang R2

[2 marks]
[*2 markah*]

ii. Total resistance, R_T
Jumlah rintangan, RT

[4 marks]
[*4 markah*]

iii. Voltage supply, V_S
Voltan bekalan, V_S

[2 marks]
[*2 markah*]

iv. Value of current at R_3 & R_4

Nilai arus pada perintang R_3 & R_4

[4 marks]
[*4 markah*]

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CLO2 (C3)

DJJ2022
CLO1 (C3)

(b) A series circuit consists of resistance of 33Ω, inductance of 250mH and capacitance of 450μF. This circuit is connected to 120V, 50Hz. Compute;

Suatu litar sesiri mengandungi perintang 333Ω, pearuh 25mH dan pemuat 450μF. Bekalan kuasa 120V, 50Hz disambungkan kepada litar tersebut. Kirakan;

i. Impedance, Z

Galangan, Z

[6 marks]
[*6 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

[2 marks]
[*2 markah*]

iv. Real power, P

Kuasa sebenar, P

[3 marks]
[*3 markah*]

QUESTION 2
SOALAN 2

DJJ20053
CLO2 (C3)

DJJ2022
CLO1 (C3)

a) A coil of 300 turns is wound uniformly on a ring of non-magnetic material. The ring has a mean circumference of 40cm and a uniform cross-sectional area of $4cm^2$. If the current in the coil is 5A, calculate:
Satu gegelung 300 belitan dililit pada satu cincin tidak bermagnet. Cincin tersebut berlilitan 40cm dan keratan rentas luas cincin tersebut ialah $4cm^2$. Jika arus mengalir pada gegelung tersebut ia 5A, kirakan:

i. Magnetic field strength, H
Kekuatan medan magnet, H

[3 marks]
[*3 markah*]

ii. Flux density, β
Ketumpatan fluks, β

[3 marks]
[*3 markah*]

iii. Total magnetic flux, φ
Jumlah fluks magnet, φ

[3 marks]
[*3 markah*]

DJJ20053
CLO2 (C3)

DJJ2022
CLO1 (C3)

b) A 45kVA, 1400 V/100 V, 50 Hz, single phase transformer has 60 secondary windings. Calculate:
Satu pengubah fasa tunggal 45kVA, 1400V/100V, 50Hz mempunyai 60 belitan sekunder. Kirakan:

i. The primary and secondary current
Arus primer dan sekunder

[4 marks]
[*4 markah*]

ii. The number of primary turns
Jumlah belitan primer

[2 marks]
[*2 markah*]

iii. The maximum value of the flux, φ_m

Nilai fluks maximum, φ_m

[2 marks]
[*2 markah*]

iv. Ratio of the transformer, K

Nisbah transformer, K

[2 marks]
[*2 markah*]

DJJ20053
CLO2 (C3)

DJJ2022
CLO1 (C3)

(c) A 20hp three phase induction motor with 208V, 60Hz and 6 poles delivers 15kW at slip of 5%. Calculate:

Sebuah motor peraruh tiga fasa berkuasa 20hp, 208V, 60 Hz dan mempunyai 6 kutub boleh menghantar kuasa sebanyak 15kW pada nilai gelinciran 5%. Kirakan:

i. Synchronous speed, Ns

Kelajuan segerak, Ns

[2 marks]
[2 *markah*]

ii. Rotor speed, Nr

Kelajuan rotor, Nr

[2 marks]
[2 *markah*]

iii. Rotor frequency, fr

Frekuensi rotor, fr

[2 marks]
[2 *markah*]

SOALAN TAMAT

TABLE OF FORMULA

INTRODUCTION TO ELECTRICAL CIRCUITS

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

$P = IV$ $E = Pt$

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

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

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

AC MACHINES

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

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

$E = 2.22 K_d K_p f \phi Z$

TRANSFORMER

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

$E_2 = 4.44 f N_2 \Phi_m$

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

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

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

$B = \mu H$

$\mu = \mu_o \mu_r$

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