

SECTION B : 60 MARKS
BAHAGIAN B : 60 MARKAH

INSTRUCTION:

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

ARAHAN:

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

QUESTION 1

SOALAN 1

CLO1
C1

- (a) Identify the meaning of parameters “P, a, and Z” in the equation of

$$E = \frac{NZ\Phi P}{60a}$$

Berikan maksud parameter “P, a, dan Z” dalam persamaan

$$E = \frac{NZ\Phi P}{60a}$$

[3 marks]

[3 markah]

CLO 1
C2

- (b) Explain **FIVE (5)** parts of DC generator and briefly describe the function for each part.

Terangkan LIMA (5) bahagian sebuah penjana AT dan nyatakan fungsi setiap bahagian.

[5 marks]

[5 markah]

CLO 2
C3

- (c) A 30kW, 300V DC shunt generator has an armature and field resistances of 0.05Ω and 100Ω respectively. Calculate the total power developed by the armature.

Sebuah penjana pirau 30kW, 300V A.T masing-masing mempunyai rintangan angkiran dan medan sebanyak 0.05Ω dan 100Ω. Kirakan jumlah kuasa yang dibangunkan oleh angkiran.

[7 marks]

[7 markah]

QUESTION 2
SOALAN 2

CLO1
C1

(a) Label the X, Y, and Z direction of Fleming's Left Hand Rule at Figure A1.

Label arah X, Y dan Z iaitu Hukum Tangan Kiri Fleming pada Rajah A1.

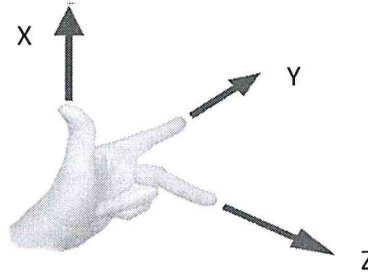


Figure A1 / Rajah A1

[3 marks]
[3 markah]

CLO 1
C2

(b) There are two types of DC Compound Motor, describe both DC Compound Motor with the aid of relevant circuit diagram.

Terdapat dua jenis motor AT majmuk, jelaskan kedua-dua motor berkenaan dengan bantuan gambarajah litar yang bersesuaian.

[5 marks]
[5 markah]

CLO2
C3

(c) A 333V shunt motor supply with total current of 88A, shunt current 7.57A and runs at 111 rpm. If the iron, friction and windage loss amounted to 1.5kW, armature winding resistance and shunt winding resistance is 0.11Ω and 44Ω respectively. Calculate the total loss of the motor.

Sebuah motor pirau 333V, menghantar keseluruhan arus bernilai 88A, arus pirau 7.57A pada kelajuan 1111 psm. Jika kehilangan besi, geseran dan angin berjumlah 1.5kW dan belitan angkir dan pirau masing-masing bernilai 0.11Ω dan 44Ω . Kirakan jumlah keseluruhan kehilangan motor tersebut.

[7 marks]
[7 markah]

QUESTION 3**SOALAN 3**CLO 1
C2

- (a) Determine
- THREE (3)**
- basic types of ac generators.

Tentukan TIGA(3) jenis penjana AC yang asas.[3 marks]
[3 markah]CLO 1
C3

- (b) A three phase AC generator is rated 400 volts, 600kW when connected in delta.

Calculate:

- i. Line current (I_L) and phase current (I_{phase}) for this generator.
- ii. Phase I_{phase} for this generator when connected to the star.

Sebuah penjana AU tiga fasa berkadaran 400 volt, 600kW apabila disambung secara delta. Kirakan:

- i. Arus talian (I_L) dan arus fasa (I_{fasa}) untuk penjana ini.
- ii. Arus fasa (I_{fasa}) untuk penjana ini apabila bersambungan bintang.

[6marks]
[6 markah]CLO2
C3

- (c) A 3 phase, 8 pole alternator is star (Y) connected. The stator has 160 slots with 6 conductors per slot with full-pitched distributed winding. If the rotor speed is 750rpm, calculate the flux required in the air gap to generate an emf of 1000 V between lines. Assume the distribution factor is 0.85.

Sebuah penjana AU 3 fasa, 8 kutub bersambungan bintang (Y). Pemegun mempunyai 160 lubang alur dengan 6 pengalir setiap lubang alur dengan 'full-pitched' belitan agihan. Jika kelajuan pemutar adalah 750psm, kirakan fluks yang diperlukan di dalam sela udara untuk menjanakan dge sebanyak 1000V antara talian. Anggapkan faktor agihan sebanyak 0.85.[6marks]
[6 markah]

QUESTION 4**SOALAN 4**CLO1
C2

- (a) Identify
- THREE (3)**
- types of single phase motor.

Kenalpasti TIGA (3) jenis motor satu fasa.[3 marks]
[3 markah]CLO1
C3

- (b) Interpret difference between main winding and auxiliary winding in a split phase induction motor.

Tafsirkan perbezaan di antara belitan utama dan belitan tambahan dalam motor aruhan fasa belah.[6 marks]
[6 markah]CLO2
C3

- (c) 3-phase star connected synchronous generator supplies a load of 10MW at power factor 0.85 lagging and a terminal voltage of 11kV. The armature resistance is
- $0.1 \Omega/\Phi$
- and synchronous reactance of
- $0.66 \Omega/\Phi$
- .

Calculate:

- i. The armature current
- ii. The internal generated voltage

*Sebuah penjana segerak 3 fasa sambungan bintang membekalkan beban sebanyak 10MW pada faktor kuasa 0.85 mengekor dan voltan terminal sebanyak 11kV. Rintangan angker adalah $0.1 \Omega/\Phi$ and regangan segerak of $0.66 \Omega/\Phi$.**Kirakan:*

- i. Arus angker
- ii. Voltan dalaman yang dijana

[6 marks]
[6 markah]

SECTION C : 30 MARKS
BAHAGIAN C : 30 MARKAH

INSTRUCTION:

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

ARAHAN:

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

QUESTION 1

SOALAN 1

CLO2
C3

A 10 Hp, 240v DC shunt motor has a full speed of 1500 rpm. The armature and shunt resistance is 0.3Ω and 240Ω respectively. Assuming a voltage drop 4V at the brush, calculate :

- i. Armature current when the back emf is 220V.
- ii. Shaft Torque (T_{sh}).
- iii. Armature Torque (T_a)
- iv. Total copper loss
- v. Motor efficiency when the input current is 40 Amp.

Sebuah motor A.T jenis pirau 10Kk, 240V mempunyai kelajuan beban penuh 1500psm.

Rintangan belitan angker dan medan pirau masing-masing berjumlah 0.3Ω dan 240Ω .

Dengan mengandaikan kejatuhan voltan pada berus sebanyak 4V, kirakan nilai :

- i. *Arus angker apabila voltan balikan bernilai 220V.*
- ii. *Dayakilas aci (T_{sh}).*
- iii. *Dayakilas angker (T_a)*
- iv. *Jumlah kehilangan tembaga*
- v. *Kecekapan motor apabila arus masukan bernilai 40Amp.*

[15 marks]
[15 markah]

QUESTION 2**SOALAN 2**CLO2
C3

An induction motor, 3 phase, 50 Hz, 6 poles, 15Hp, 415V and 60A each line has a slip of 1% at no-load and 3% at full load. Calculate:-

- i. synchronous speed
- ii. no load speed
- iii. full load speed
- iv. frequency of rotor at standstill
- v. frequency of rotor at full load
- vi. power factor
- vii. efficiency

Sebuah motor aruhan 3 fasa, 50Hz, 6 kutub, 15Kk, 415V dan 60A setiap talian mempunyai gelincir sebanyak 1 % pada keadaan tanpa beban dan 3 % pada keadaan beban penuh. Kirakan:-

- i. kelajuan segerak*
- ii. kelajuan tanpa beban*
- iii. kelajuan penuh beban*
- iv. frekuensi pemutar pada keadaan pegun*
- v. frekuensi pemutar pada keadaan penuh beban*
- vi. faktor kuasa*
- vii. kecekapan*

[15 marks]
[15 markah]

SOALAN TAMAT

FORMULA
DET3043 – ELECTRICAL MACHINES

DC MACHINE	AC MACHINE
$Z = 2CN_c$	$N_s = \frac{120f_s}{P} \text{ rpm}$
$V_t = E_g - V_a - V_s - V_{\text{brush}} \text{ volt}$	$\%s = \frac{N_s - N_r}{N_s} \times 100\%$
$E = \frac{\emptyset PNZ}{60a} \text{ volt}$	$N_{\text{slip}} = N_s - N_r \text{ rpm}$
$I = \frac{V_t}{R} \text{ amp}$	$f_r = sf_s \text{ Hz}$
$I = \frac{P}{V_t} \text{ amp}$	$P = \sqrt{3} V_L I_L \cos\phi \text{ watt}$
$P_{\text{out}} = V_t I_f = P_{\text{in}} - P_{\text{tot.loss}}$	$E_p = 2.22 k_p k_d f \emptyset Z \text{ v/phase}$
$T_a = \frac{E_b I_a}{2\pi N} \text{ Nm}$	$E = \sqrt{(V_t \cos \emptyset + I_a R_a)^2 + (V_t \sin \emptyset \pm I_a X_a)^2} \text{ v/phase}$
$T_{\text{sh}} = \frac{P_{\text{out}}}{2\pi N} \text{ Nm}$	$E_g = V \emptyset L \emptyset^0 + (I_a L - \theta)(R_a + jX_s)$
$\% \text{ Efficiencies, } \% \eta = \frac{P_{\text{out}}}{P_{\text{in}}} \times 100\%$	$\% \text{ Efficiencies, } \% \eta = \frac{P_{\text{out}}}{P_{\text{in}}} \times 100\%$