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**KOLEJ YAYASAN PELAJARAN JOHOR  
FINAL EXAMINATION**

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**COURSE NAME : TEKNOLOGI ELEKTRIK**  
**COURSE CODE : DEG 1082**  
**EXAMINATION : OCT 2017**  
**DURATION : 2 HOURS**

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**INSTRUCTION TO CANDIDATES**

1. This examintaion paper consists **FIVE (5)** questions. Answer **FOUR (4)** questions only in the answer booklet provided.
  
2. Candidates are not allowed to bring any material to examination room except with the permission from the invigilator.
  
3. Please check to make sure that this examination pack consist of:
  - i. Question Paper
  - ii. Answer Booklet

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*This examination paper consists of **8** printed pages including front page*



This part contains of **FIVE(5)** questions. Answer **FOUR (4)** questions only in the answer booklet provided.

*Bahagian ini mengandungi **LIMA (5)** soalan. Jawab **EMPAT (4)** soalan sahaja di dalam buku jawapan yang disediakan.*

### QUESTION 1

- a) State TWO (2) significant of power factor correction for a circuit with low power factor.

*Nyatakan DUA (2) kepentingan pembetulan faktor kuasa bagi litar yang faktor kuasanya rendah.*

(4 marks/markah)

- b) Referring to Figure Q1(b),

- i) calculate the total current  $I_T$ , and total power triangle delivered by the voltage supply 120V when switch S is opened.
- ii) calculate the overall power factor and draw the power triangle diagram.
- iii) when switch S is closed, the overall power factor is 0.9 lagging. Calculate the value of capacitor, C.

*Merujuk Rajah Q1(b),*

- i) kirakan jumlah arus  $I_T$ , dan jumlah segitiga kuasa yang dibekalkan oleh bekalan voltan 120V apabila suis S dibuka.*
- ii) kirakan faktor kuasa keseluruhan litar dan lukiskan rajah segitiga kuasa.*
- iii) apabila suis S ditutup, faktor kuasa keseluruhan litar adalah 0.9 mengekor. Kirakan nilai pemuat C.*

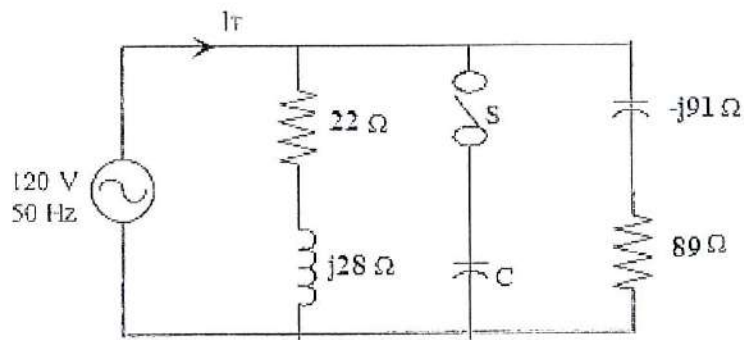


Figure Q1(b) / Rajah Q1(b)

(21 marks/markah)

**QUESTION 2**

- a) Give definition of line voltage for delta connection in three phase system.

*Berikan definisi voltan talian bagi sambungan delta dalam sistem tiga fasa.*

(3 marks/markah)

- b) Referring to Figure Q2(b), find the phase currents, line currents and active power absorbed by the each load in unbalanced three phase system. Draw the phasor diagram for all parameters.

*Merujuk Rajah Q2(b), dapatkan arus fasa, arus talian dan kuasa aktif diserap oleh setiap beban dalam sistem tiga fasa tidak seimbang. Lukiskan rajah pemfasa untuk semua parameter.*

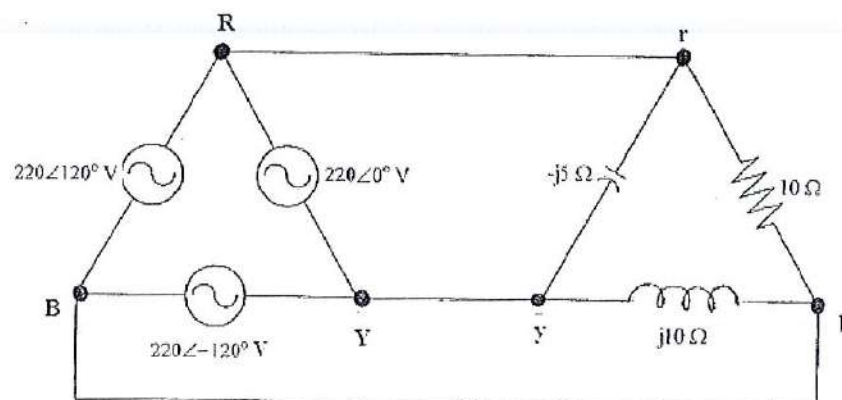


Figure Q2(b) / Rajah Q2(b)

(15 marks/markah)

- c) Figure Q2(c) shows a three phases, RBY sequence serves a balanced star load. Find the line currents and draw its phasor diagram for all parameters.

Rajah Q2(c) menunjukkan suatu sistem tiga fasa, turutan RBY dibekalkan kepada beban seimbang sambungan bintang. Tentukan arus talian dan lukiskan gambar rajah pemfasa untuk semua parameter.

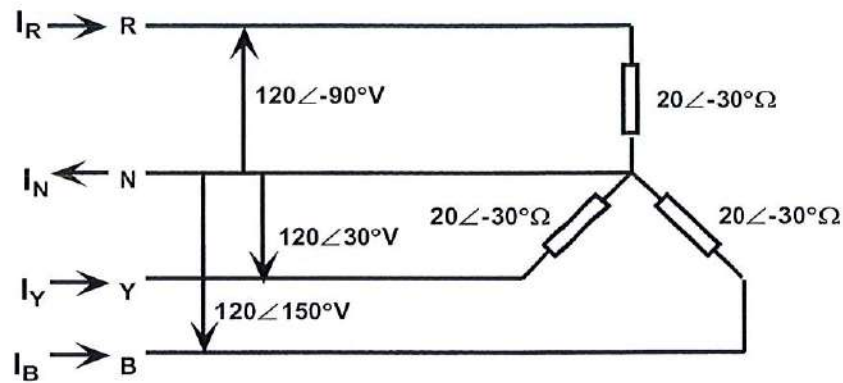


Figure Q2(c) / Rajah Q2(c)

(7 marks/markah)

**QUESTION 3**

- a) Write the equations and its unit for following terms with reference to a magnetic circuit.
- i) Electromagnetic force,  $F$ .
  - ii) Magnetic field strength,  $H$ .
  - iii) Flux density,  $B$ .
  - iv) Reluctance,  $S$ .
  - v) Permeability,  $\mu$ .

Tuliskan persamaan-persamaan dan unitnya bagi istilah berikut merujuk kepada litar magnet.

- i) Daya elektromagnet,  $F$
- ii) Kekuatan medan magnet,  $H$ .
- iii) Ketumpatan fluk,  $B$ .
- iv) Enggan,  $S$ .
- v) Ketelapan,  $\mu$ .

(10marks/markah)



b)

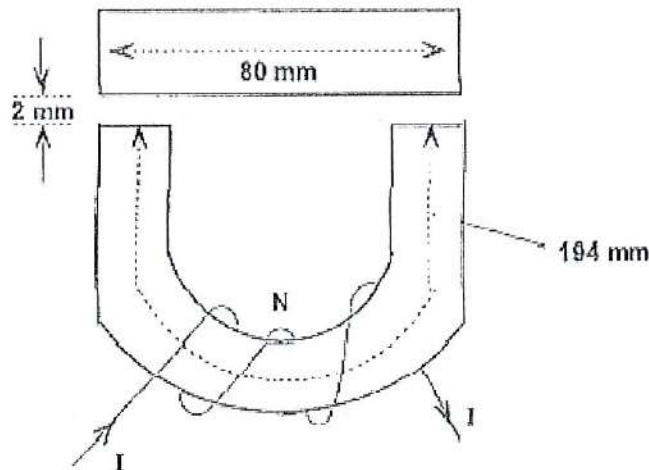


Figure Q3(b)/Rajah Q3(b)

B(Tesla)	0.9	1.05	1.25	1.35
H (AL/m)	260	450	700	820

Table Q3(b)/Jadual Q3(b)

Figure Q3(b) shows a magnetic circuit of a horse-shoe pattern with uniform cross section area of  $600 \times 10^{-6} \text{ m}^2$ . A coil of 500 turns are wound around the magnetic circuit. Using the B-H data in Table Q3(b):

- i) draw the magnetic circuit.
- ii) calculate the flux density  $B$ , and strength of magnetic field  $H$ , needed to create the  $630 \mu\text{Wb}$  magnetic flux in the magnetic circuit.
- iii) calculate the electromagnetic force  $F$ , and current  $I$ , produce by magnetic circuit.

Rajah Q3(b) menunjukkan satu litar magnet berbentuk ladam kuda yang mempunyai luas keratan rentas yang sekata iaitu  $600 \times 10^{-6} \text{ m}^2$ . Satu gegelung yang mempunyai 500 lilitan dililitkan di litar magnet tersebut. Dengan menggunakan data B-H dalam Jadual Q3(b):

- i) lukiskan litar magnet.
- ii) kirakan ketumpatan fluks,  $B$  dan kekuatan medan magnet,  $H$  yang diperlukan untuk membina fluks magnet bernilai  $630 \mu\text{Wb}$  dalam litar magnet.
- iii) Kirakan daya gerak magnet  $F$ , dan arus  $I$ , yang terhasil dari litar magnet.

(15 marks/markah)

#### QUESTION 4

- a) Name and draw TWO (2) types of transformer construction.

Namakan dan lukiskan DUA (2) jenis binaan pengubah.

(6 marks/markah)

- b)

	Open circuit test	Short circuit test
V	100V	15V
I	3A	4.5A
P	80W	40W

Table Q4(b)/Jadual Q4(b)

The test data from a single phase 1KVA, 240V/100V transformer is shown in Table Q4(b). Determine:

- i) the core loss current  $I_c$ , and the magnetism current  $I_m$ , in the core.
- ii) core loss resistance  $R_c$ , magnetism reactance  $X_m$ , equivalent resistance  $R_{sn}$  and equivalent reactance  $X_{sn}$ .
- iii) equivalent circuit referred to low voltage (LV) side.

Data ujian untuk pengubah satu fasa 1KVA, 240V/100V adalah seperti Jadual Q4(b). Tentukan:

- i) arus kehilangan besi  $I_c$ , dan arus permagnetan  $I_m$ , dalam teras.
- ii) rintangan kehilangan besi  $R_c$ , regangan permagnetan  $X_m$ , rintangan setara  $R_{sn}$  dan regangan setara  $X_{sn}$ .
- iii) litar setara pengubah merujuk ke bahagian voltan rendah (VR).

(19 marks/markah)

### QUESTION 5

- a. State FOUR (4) excitation methods of a DC generator. Draw the equivalent circuit for each method.

*Nyatakan EMPAT (4) kaedah ujaan penjana AT. Lukiskan litar setara bagi setiap kaedah.*

(8 marks/markah)

- b. A shunt wound direct current generator supplies 28kW at 240V and runs at speed of 400 rpm. The armature and field resistances are  $0.05\Omega$  and  $22\Omega$  respectively. Determine the speed of generator if it operates as a DC motor and taking inputs of 28kW at 240V.

*Satu penjana AT belitan medan pirau membekalkan 28kW pada 240V dan berkendali pada kelajuan 400 ppm. Rintangan angkir dan rintangan medan masing-masing adalah  $0.05\Omega$  and  $22\Omega$ . Tentukan kelajuan penjana tersebut sekiranya berkendali sebagai motor AT dan mengambil masukan 28kW pada 240V.*

(15 marks/markah)

- c. Give TWO (2) losses that increase the heat during operation of DC machine.

*Berikan DUA (2) kehilangan yang meningkatkan haba apabila mesin AT beroperasi.*

(2 marks/markah)



## LAMPIRAN

$$V = IZ$$

$$pf = \frac{P}{S} = \cos\theta_z$$

$$X_c = \frac{V^2}{X_c}$$

$$C = \frac{1}{\omega X_c}$$

$$V_T = \sqrt{3}V_F$$

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

$$Dgm, F = Hl = NI$$

$$\theta_{lb} = \cos^{-1}\left(\frac{P_{lb}}{V_{lb} \times I_{lb}}\right)$$

$$R_c = \frac{V_{lb}}{I_c}$$

$$X_m = \frac{V_{lb}}{I_m}$$

$$R_{sn} = \frac{P_{lb}}{I_p^2}$$

$$Z_{sn} = \frac{V_{lp}}{I_{lp}}$$

$$X_{sn} = j\sqrt{Z_{sn}^2 - R_{sn}^2}$$

$$E = \phi n$$

END OF QUESTION PAPER

