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**KOLEJ YAYASAN PELAJARAN JOHOR  
FINAL EXAMINATION**

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**COURSE NAME : TEKNOLOGI ELEKTRIK**  
**COURSE CODE : DEG 1082**  
**EXAMINATION : APRIL 2019**  
**DURATION : 2 HOURS**

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**INSTRUCTION TO CANDIDATES**

1. This examination 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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**DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO**

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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 / SOALAN 1

a)

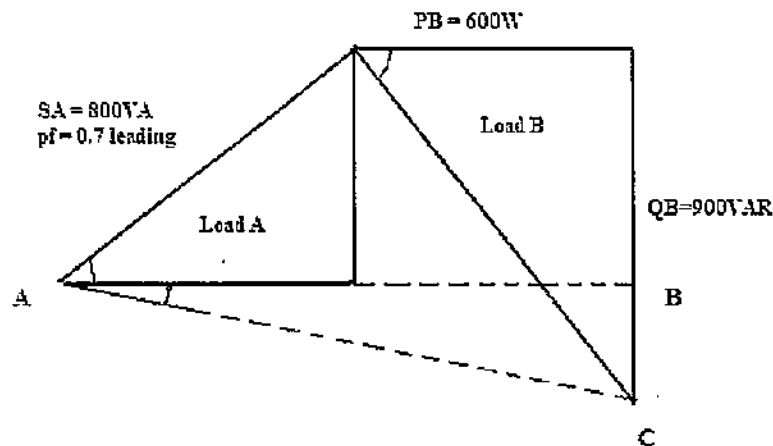


Figure Q1(a)/Rajah Q1(a)

Figure Q1(a) shows the combination of power triangles for load A and B that are parallel connected across 200V, 50Hz supply. The ABC triangle is the overall circuit power triangle. Determine:

- i) the load impedances
- ii) the total power triangle
- iii) power factor for overall circuit

Rajah Q1(a) menunjukkan gabungan segitiga kuasa untuk beban A dan beban B yang di sambung selari merintang bekalan 200V, 50Hz. Segitiga ABC merupakan segitiga kuasa bagi keseluruhan litar. Tentukan:

- i) galangan bagi beban
- ii) jumlah segitiga kuasa
- iii) faktor kuasa keseluruhan litar

(15 marks/ markah)

- b) The power factor of an AC electrical power system is defined the ratio of the real power absorbed by the load to the apparent power flowing in the circuit.
- Give three (3) disadvantages of low power factor.
  - State two (2) methods to improve the power factor correction.

*Faktor kuasa bagi sistem kuasa elektrik AU didefinisikan sebagai nisbah kuasa aktif yang diserap oleh beban kepada kuasa ketara yang melalui sebuah litar.*

- Berikan tiga (3) keburukan bagi faktor kuasa rendah.*
- Nyatakan dua (2) kaedah pembetulan faktor kuasa.*

(10 marks/ markah)

## QUESTION 2 / SOALAN 2

- a) Give the definition of line current,  $I_L$  and phase voltage,  $V_P$  for delta connection in three phase system.

*Berikan definisi arus talian,  $I_T$  dan voltan fasa,  $V_F$  bagi sambungan delta dalam sistem tiga fasa.*

(4 marks/ markah)

b)

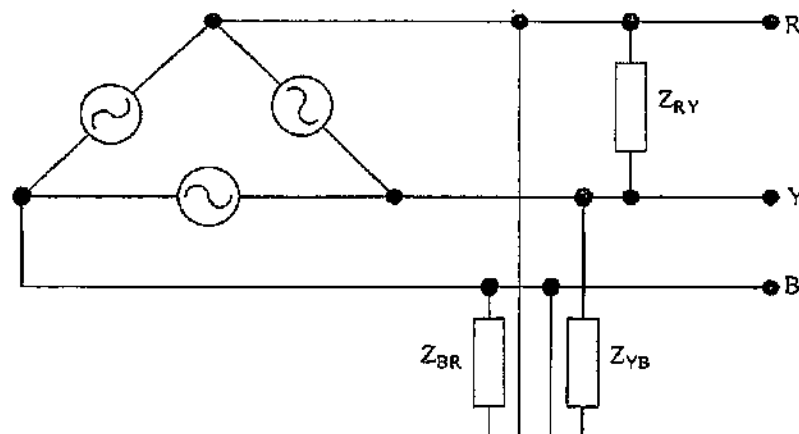


Figure Q2(b)/Rajah Q2(b)

Figure Q2(b) show a balanced three phase load having impedance  $7+j4\Omega$ . The three phase delta connected generator supplies voltage 333V. Determine:

- the line current,  $I_T$  for the circuit and the current in each load.
- the active, reactive and complex power.
- draw the phasor diagram for all voltage and current parameter.

Rajah Q2(b) menunjukkan beban tiga fasa seimbang mempunyai galangan  $7+j4\Omega$ . Penjana tiga fasa sambungan delta membekalkan voltan 333V. Tentukan:

- arus talian,  $I_T$  bagi litar dan arus dalam setiap beban.
- kuasa aktif, kuasa regangan dan kuasa kompleks.
- lukiskan rajah pemfasa untuk semua parameter voltan dan arus.

(21 marks/ markah)

### QUESTION 3 / SOALAN 3

a) Explain the definition of the following terms in magnetic circuit:

- flux leakage.
- eddy current losses.

Nyatakan definisi sebutan-sebutan berikut di dalam litar magnet:

- kebocoran fluks.
- kehilangan arus pular.

(10 marks/ markah)

b)

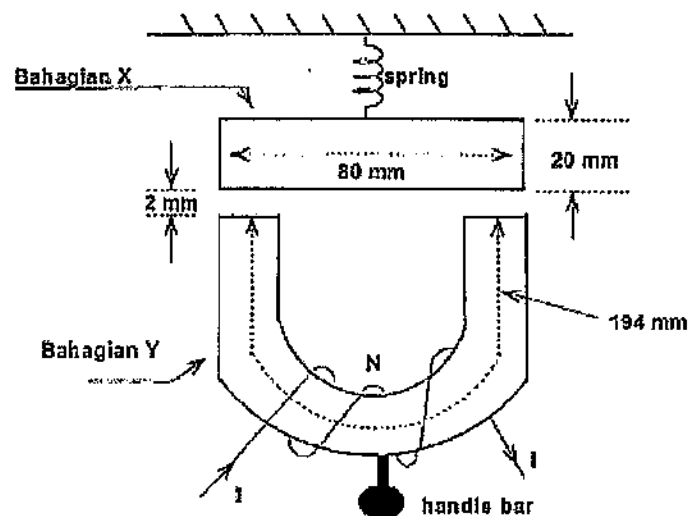


Figure Q3(b)/Rajah Q3(b)

B(Tesla)	0.22	0.36	0.44	0.48
$\mu_r$	3600	3300	2900	2600

Table Q3(b)/Jadual Q3(b)

Figure 3(b) show a magnetic circuit of a horse-shoe pattern with uniform cross section area of  $601\text{mm}^2$ . A coil of 200 turn are wound around on part Y of the magnetic circuit. If part X and Y are not attached to each other, a flux of  $2.16 \times 10^{-4} \text{ Wb}$  are produce in magnetic circuit.

- Draw the magnetic circuit.
- Calculate the required current,  $I$  supplied to the coil so that part X and Y are not attached.
- If required that part X and Y are attached to each other, calculate the current,  $I$  flowing through the coil.

*Rajah 3(b) menunjukkan satu litar magnet berbentuk ladam kuda yang mempunyai luas keratan rentas  $601\text{mm}^2$ . Satu gelung yang mempunyai 200 lilit, dililitkan di bahagian Y litar magnet tersebut. Jika bahagian X dan Y tidak bercantum di antara satu sama lain, fluks  $2.16 \times 10^{-4} \text{ Wb}$  terhasil di dalam litar magnet.*

- Lukiskan litar magnet.*
- Kirakan arus,  $I$  yang perlu dibekalkan kepada gelung supaya bahagian X dan Y tidak bercantum.*
- Jika dikehendaki bahawa X dan Y bercantum antara satu sama lain, kirakan arus,  $I$  yang mengalir melalui gelung.*

(15 marks/ markah)

**QUESTION 4 / SOALAN 4**

- State the definition of single phase transformer in electrical system. Give the ratio are used in single phase transformer.

*Berikan istilah pengubah satu fasa dalam sistem elektrik. Berikan bentuk nisbah yang digunakan di dalam pengubah satu fasa.*

(4 marks/ markah)

- b) With the aid of diagram, state **two (2)** types of single phase transformer construction.

*Dengan bantuan gambarajah, nyatakan dua (2) jenis struktur binaan pengubah satu fasa.*

(6 marks/ markah)

- c) Single phase transformer have low voltage (LV) side and high voltage (HV) side Explain briefly about LV, HV and the related with primer and secondary.

*Pengubah satu fasa mempunyai bahagian voltan rendah dan bahagian voltan tinggi. Huraikan secara ringkas mengenai VR, VT dan kaitan dengan primer dan sekunder.*

(6 marks/ markah)

- d) A transformer having 90 turns on the primary and 360 turns on the secondary is connected to a 200 V, 50Hz source. The load across the secondary draws a current of 2A at power factor 85% lagging. Calculate:

- i) the effective value of the primary current.
- ii) the insttantaneous current in primary when the current in secondary is 200mA and voltage at the load.
- iii) the maximum flux linked by the secondary winding.

*Sebuah pengubah mempunyai 90 lilitan pada primer dan 360 lilitan pada sekunder disambungkan kepada bekalan 200 V, 50Hz. Beban melintangi sekunder menghasilkan arus 2A pada faktor kuasa 85% mengekor. Kirakan:*

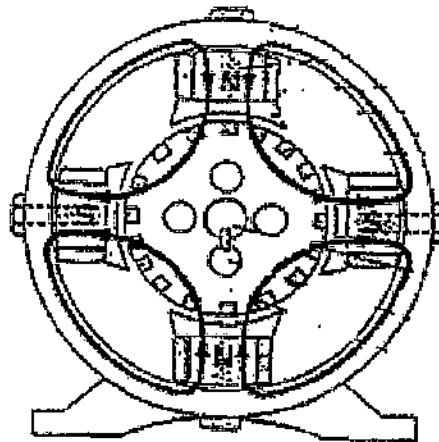
- i) nilai berkesan arus primer.
- ii) arus ketika di primer apabila arus di sekunder adalah 200mA dan voltan pada beban.
- iii) fluks maksimum merangkai belitan sekunder.

(9 marks/ markah)

## QUESTION 5 / SOALAN 5

- a) The construction of DC machine in **Figure 5(a)** has the static part and rotation part. State the functions of each part in DC machine.

*Binaan mesin AT di dalam **Rajah 5(a)** mempunyai bahagian pegun dan bahagian berputar. Nyatakan fungsi bagi setiap bahagian di dalam mesin AT.*



**Figure Q5(a)/Rajah Q5(a)**

(6 marks/ markah)

- b) A shunt wound DC generator supplies 100kW at 500V and runs at speed of 800 rpm. The armature and field resistances are  $0.1\Omega$  and  $100\Omega$  respectively. Determine the speed of generator if it operates as a DC motor and taking inputs of 100kW at the same busbar.

*Satu penjana AT belitan medan pirau membekalkan 100kW pada 500V dan berkendali pada kelajuan 800 ppm. Rintangan angker dan rintangan medan masing-masing adalah  $0.1\Omega$  and  $100\Omega$ . Tentukan kelajuan penjana tersebut sekiranya berkendali sebagai motor AT dan mengambil masukan 100kW pada basbar yang sama.*

(16 marks/ markah)

- c) Give **three (3)** losses that increase the heat during operation of DC machine.

*Berikan **tiga (3)** kehilangan yang meningkatkan haba apabila mesin AT beroperasi.*

(3 marks/ markah)



## APPENDIX / LAMPIRAN

$$V = IZ$$

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

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

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

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

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

$$Dgm, F = Hl = NI$$

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

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

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

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

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

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

$$E = \phi n$$

END OF QUESTION PAPER

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