



**KOLEJ YAYASAN PELAJARAN JOHOR
FINAL EXAMINATION**

COURSE NAME : TEKNOLOGI ELEKTRIK
COURSE CODE : DEG 1082
EXAMINATION : NOVEMBER 2020
DURATION : 2 HOURS

**INSTRUCTION TO CANDIDATES/
ARAHAN KEPADA CALON**

1. This examination paper consists **FIVE (5)** questions. Answer **FOUR (4)** questions only in the answer booklet provided.
Kertas peperiksaan ini mengandungi LIMA (5) soalan. Jawab EMPAT (4) soalan sahaja di dalam buku jawapan yang disediakan.

2. Candidates are not allowed to bring any material to examination room except with the permission from the invigilator.
Calon tidak dibenarkan untuk membawasebarang bahan/ nota ke bilik peperiksaan tanpa arahan/ kebenaran daripada pengawas.

3. Please check to make sure that this examination pack consist of:
Pastikan kertas soalan peperiksaan ini mengandungi :
 - i. Question Paper
Kertas Soalan
 - ii. Answer Booklet
Buku jawapan

**DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO
JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU**

This examination paper consists of 8 printed pages including front page
Kertas soalan ini mengandungi 8 muka surat termasuk kulit hadapan

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)

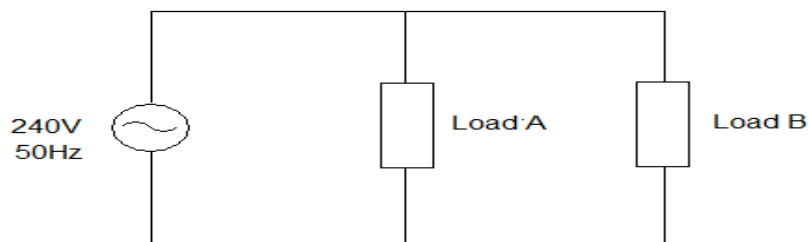


Figure 1(a)/ Rajah 1(a)

Referring to **Figure 1(a)**, show the overall power triangle and the power factor.

Load A: Inductive load, 20 kVA, power factor 0.8.

Load B: Capacitive load, -35kVAR, power factor 0.9

*Merujuk kepada **Rajah 1(a)**, tunjukkan segitiga kuasa keseluruhan litar serta faktor kuasanya.*

Beban A: Beban pearuh, 20kVA, faktor kuasa 0.8

Beban B: Beban pemuat, -35kVAR, faktor kuasa 0.9

(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.
- State **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.

*i) Nyatakan **tiga (3)** keburukan bagi faktor kuasa rendah.*

*ii) Nyatakan **dua (2)** kaedah pembetulan faktor kuasa.*

(10 marks/ markah)

QUESTION 2 / SOALAN 2

- a) Give **two (2)** advantages of three phase system.

Berikan **dua (2)** kebaikan sistem tiga fasa.

(4 marks/ markah)

- b) A three phase motor is being modeled by a star connected circuit as shown in **Figure Q2(b)**. The motor received its supply from a three phase star connected generator, 220V, 50Hz. At $t=t_1$, line Y condition are an open circuit. Determine the line current I_R , I_Y , I_B and the active power absorbed by the motor at the following conditions:

- $t < t_1$.
- $t > t_1$.

Sebuah motor tiga fasa dimodelkan oleh satu litar sambungan bintang seperti **Rajah Q2(b)**. Motor mendapat bekalan daripada penjana tiga fasa sambungan bintang, 220V, 50Hz. Pada ketika $t=t_1$, talian Y berkeadaan litar buka. Tentukan arus talian I_R , I_Y , I_B dan kuasa aktif diserap oleh motor tersebut bagi keadaan berikut:

- $t < t_1$.
- $t > t_1$.

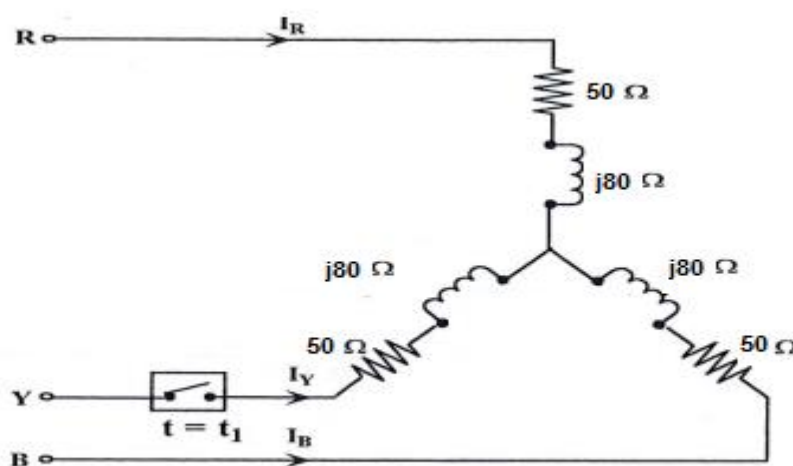


Figure Q2(b) / Rajah Q2(b)

(21 marks/ markah)

QUESTION 3 / SOALAN 3

- a) State the equations and its unit for following terms with reference to a magnetic circuit.
- Electromagnetic force, F .
 - Magnetic field strength, H .
 - Flux density, B .
 - Reluctance, S .
 - Permeability, μ .

Nyatakan persamaan dan unitnya bagi istilah berikut merujuk kepada litar magnet.

- Daya elektromagnet, F .*
- Kekuatan medan magnet, H .*
- Ketumpatan fluk, B .*
- Engganan, S .*
- Ketelapan, μ .*

(10 marks/ markah)

- b) A ring made from cast steel has a mean length of 8cm and cross section area of $2.5 \times 10^{-4} \text{ m}^2$ is made up of circular section of cast steel with the air gap 4mm. A coil of 280 turns are wound around the magnetic circuit. Using the B-H data in **APPENDIX B**:
- sketch the magnetic circuit.
 - calculate the flux density, B and strength of magnetic field H , needed to create the $228 \mu\text{Wb}$ magnetic flux in the magnetic circuit.
 - calculate the electromagnetic force, F and current, I produce by 400 turns in magnetic circuit.

*Satu gelang diperbuat daripada keluli tuangan mempunyai panjang min 8cm dan luas keratan rentas $2.5 \times 10^{-4} \text{ m}^2$ diperbuat daripada keluli tuangan dengan mempunyai sela udara 4mm. Satu gegelung yang mempunyai 280 lilitan dililitkan di litar magnet tersebut. Dengan menggunakan data B-H dalam **LAMPIRAN B**:*

- lakarkan litar magnet.*
- kirakan ketumpatan fluks, B dan kekuatan medan magnet, H yang diperlukan untuk membina fluks magnet bernilai $228 \mu\text{Wb}$ dalam litar magnet.*

- iii) kirakan daya gerak magnet, F dan arus, I yang terhasil daripada 400 lilitan dalam litar magnet

(15 marks/ markah)

QUESTION 4 / SOALAN 4

- a) Explain the definition of single phase transformer in electrical system. Give the ratio are used in single phase transformer.

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

(4 marks/ markah)

b)

	Open circuit test/ ujian litar buka	Short circuit test/ ujian litar pintas
V	240V	55V
I	1.6A	12.5A
P	115W	360W

Table Q4(b)/Jadual Q4(b)

The test data from a single phase 5KVA, 2400V/240V transformer is shown in **Table Q4(b)**. Determine:

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

Data ujian untuk pengubah satu fasa 5KVA, 2400V/240V adalah seperti **Jadual Q4(b)**. Tentukan:

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

(21 marks/ markah)

QUESTION 5 / SOALAN 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) Give **two (2)** types of armature winding arrangement.

Berikan dua (2) jenis susunan bagi belitan angkir.

(2 marks/ markah)

- c) A shunt field DC generator, delivers a terminal voltage of 240V to a resistance load of 7Ω. The generator has field and armature resistances of 350Ω and 5Ω respectively, determine:

- i) the DC generator circuit.
- ii) the load current.
- iii) the field current.
- iv) the power at field.
- v) the armature current.
- vi) induced emf at the armature.
- vii) the total power delivered to the load.

Penjana AT medan pirau membekalkan voltan terminal sebanyak 240V kepada beban perintang sebanyak 7Ω. Penjana tersebut mempunyai rintangan medan dan angker sebanyak 350Ω dan 5Ω masing-masing, tentukan:

- i) *litar bagi penjana AT.*
- ii) *arus beban.*
- iii) *arus medan.*
- iv) *kuasa pada medan.*
- v) *arus angkir.*
- vi) *dge teraruh pada angker.*
- vii) *jumlah kuasa yang dibekalkan kepada beban.*

(15 marks/ markah)

APPENDIX A / LAMPIRAN A

$$V = IZ$$

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

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

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

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

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

$$Dgm, F = HI = NI$$

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

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

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

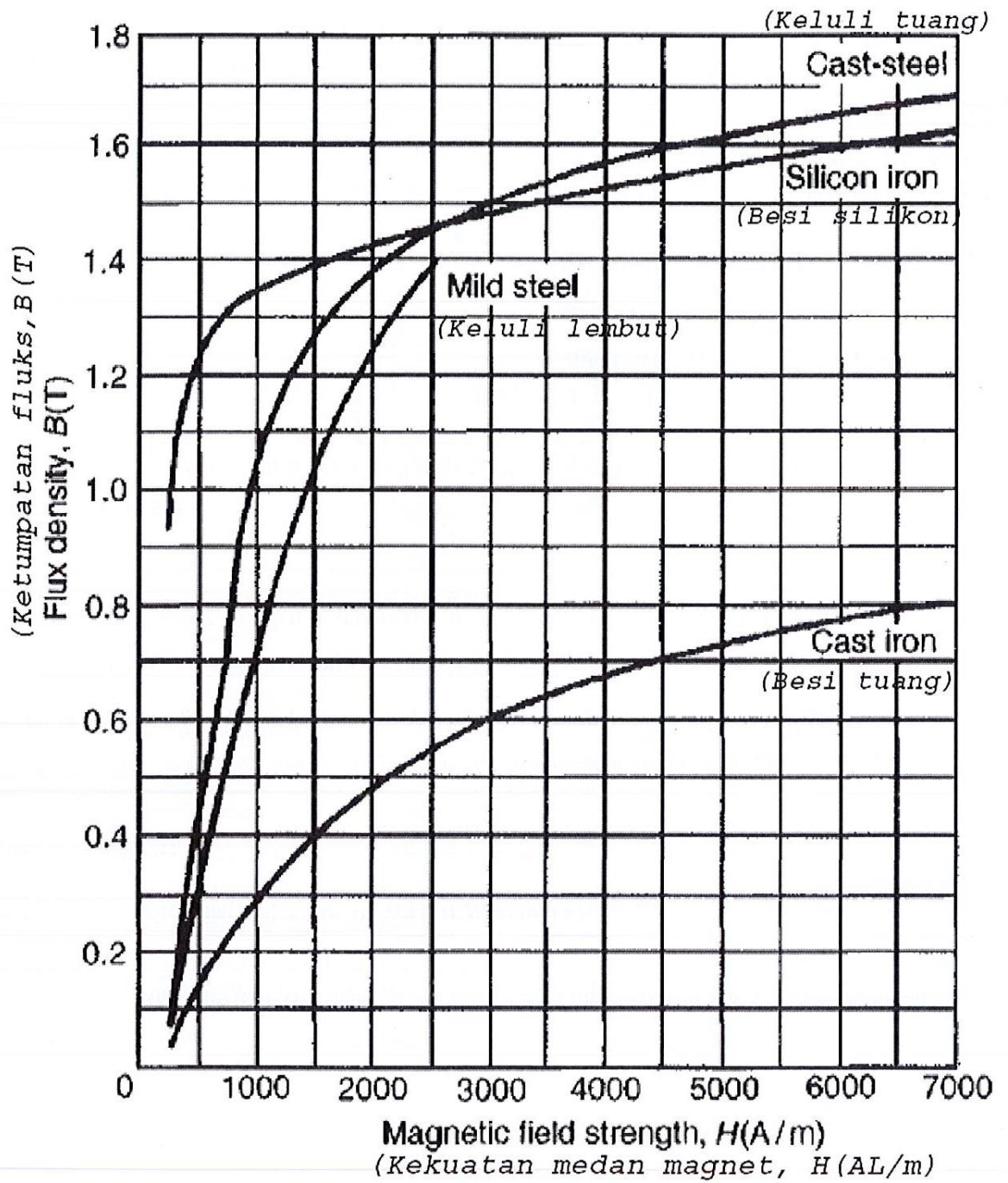
$$R_{sn} = \frac{P_{lb}}{I_p^2}$$

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

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

$$E = \phi n$$

APPENDIX B / LAMPIRAN B



[100 marks/ markah]

END OF QUESTION PAPER/ KERTAS SOALAN TAMAT