



**KOLEJ YAYASAN PELAJARAN JOHOR
FINAL EXAMINATION**

COURSE NAME : TEKNOLOGI ELEKTRIK
COURSE CODE : DEG 1082
EXAMINATION : JANUARY 2024
DURATION : 2 HOURS

**INSTRUCTION TO CANDIDATES/
ARAHAN KEPADA CALON.**

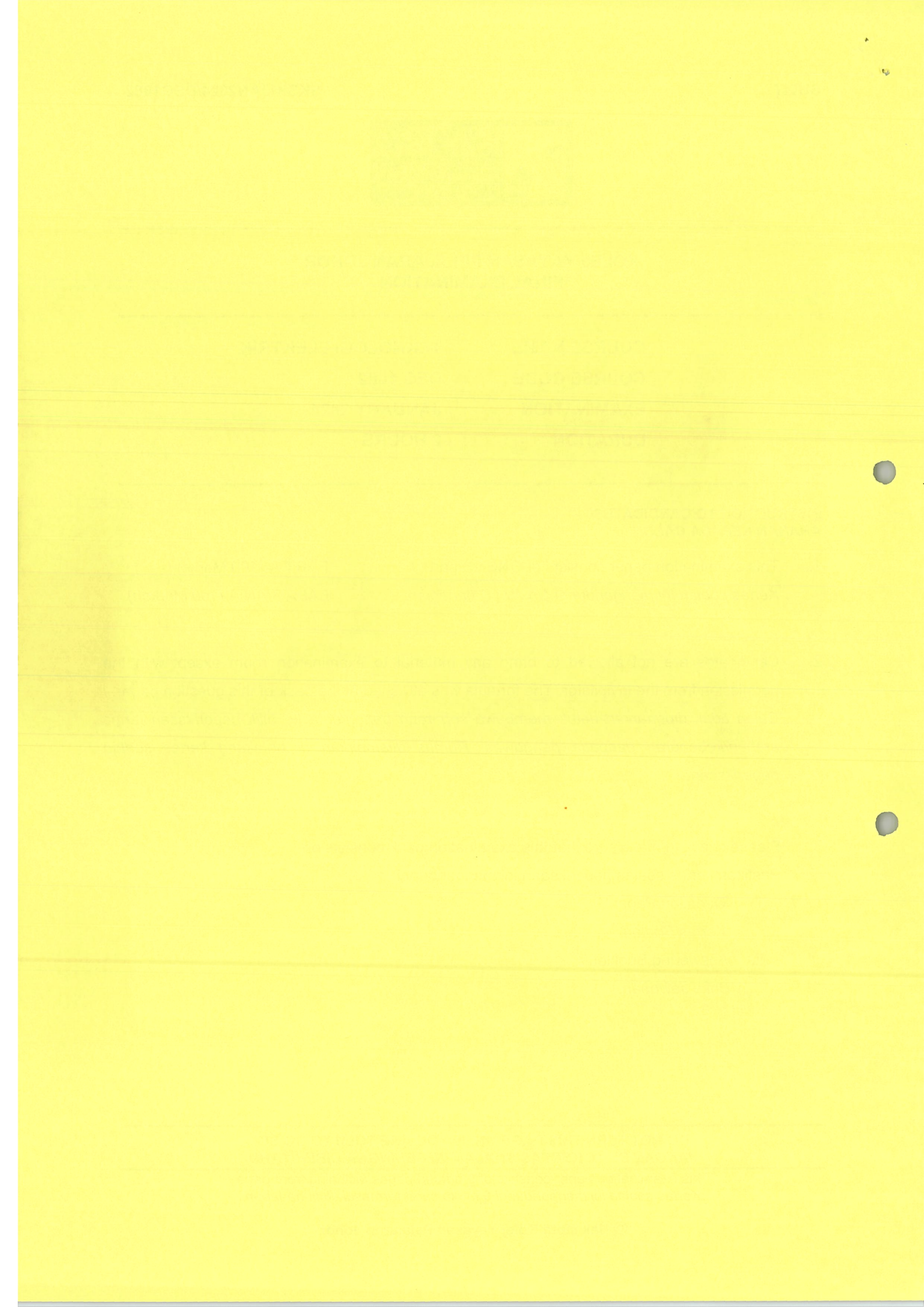
1. This examination paper consists of **ONE (1)** part : / PART A (100 Marks) /
*Kertas soalan ini mengandungi **SATU (1)** bahagian:* BAHAGIAN A (100 Markah)

2. Candidates are not allowed to bring any material to examination room except with the permission from the invigilator. The formula was attached at the back of this question paper. /
Calon tidak dibenarkan untuk membawa sebarang bahan/nota ke bilik peperiksaan tanpa arahan/kebenaran daripada pengawas. Rumus dilampirkan di belakang kertas soalan peperiksaan.

3. Please check to make sure that this examination pack consists of: /
Pastikan kertas soalan peperiksaan ini mengandungi:
 - i. Question Paper. /
Kertas Soalan.
 - ii. Answering 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 **9** printed pages including front page
*Kertas soalan ini mengandungi **9** muka surat termasuk kulit hadapan*



This part contains **FIVE (5)** questions. Answer **FOUR (4)** questions only in the Answering Booklet.

*Bahagian ini mengandungi **LIMA (5)** soalan. Jawab **EMPAT (4)** soalan sahaja di dalam Buku Jawapan.*

QUESTION 1 / SOALAN 1

- a) Referring to **Figure 1**, a circuit is supplied by a 240V, consist of two parallel load Z_1 and Z_2 . Load Z_1 is a 50Ω impedance with leading power factor of 0.7 and load Z_2 is 40Ω impedance with lagging power factor of 0.64. Calculate the active, reactive and apparent power for :
- load Z_1
 - load Z_2
 - overall circuit.
 - power triangle for overall circuit

(15 marks/ markah)

- b) The power factor of an AC electrical power system is defined by 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.

(10 marks/ markah)

- a) *Merujuk kepada **Rajah 1**, satu litar mendapat bekalan 240V, terdiri daripada dua beban Z_1 dan Z_2 . Beban Z_1 merupakan galangan 50Ω dengan faktor kuasa 0.7 mendahulu dan beban Z_2 merupakan galangan 40Ω dengan faktor kuasa 0.64 mengekor. Kirakan kuasa aktif, kuasa reaktif dan kuasa ketara untuk :*

- beban Z_1*
- beban Z_2*
- keseluruhan litar*
- segitiga kuasa keseluruhan litar.*

- b) *Faktor kuasa bagi sistem kuasa elektrik AU didefinisikan sebagai nisbah kuasa aktif yang diserap oleh beban kepada kuasa ketara yang melalui sebuah litar.*
- Nyatakan **tiga (3)** keburukan bagi faktor kuasa rendah.*
 - Nyatakan **dua (2)** kaedah pembetulan faktor kuasa.*

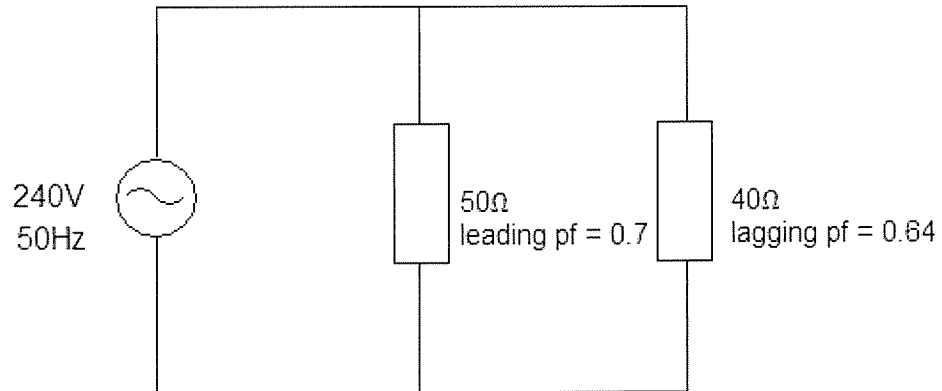


Figure 1 / Rajah 1

QUESTION 2 / SOALAN 2

- a) Explain the definition of three phase system and give **three (3)** advantages of three phase system.

(10 marks/ markah)

- b) **Figure 2** shows a balanced three phase load having impedance $15\angle 40^\circ \Omega$. The three phase delta connected generator supplies voltage 220V. Determine:
- the line current, I_L for the circuit and the current in each load.
 - the active power.
 - draw the phasor diagram for all voltage and current parameter.

(15 marks/ markah)

- a) *Jelaskan definisi sistem tiga fasa dan berikan **tiga (3)** kebaikan sistem tiga fasa.*

- b) **Rajah 2** menunjukkan beban tiga fasa seimbang mempunyai galangan $15\angle 40^\circ \Omega$. Penjana tiga fasa sambungan delta membekalkan voltan 220V. Tentukan:

- arus talian, I_L bagi litar dan arus dalam setiap beban.*
- kuasa aktif.*
- lukiskan rajah pemfasa untuk semua parameter voltan dan arus.*

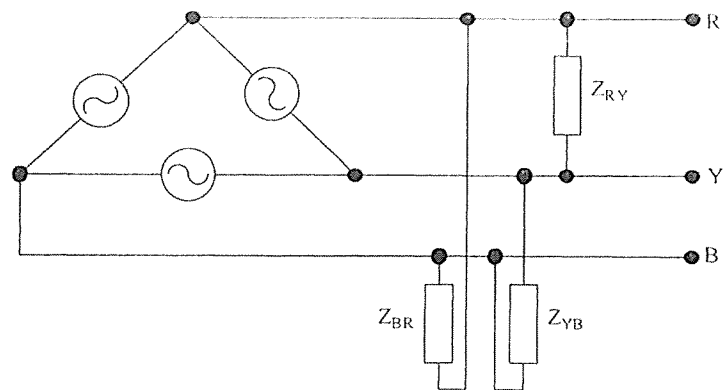


Figure 2 / Rajah 2

QUESTION 3 / SOALAN 3

a) Define the 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, μ .

(10 marks/ markah)

b)

	Mean length	Cross section area
Cast steel	350mm	$220 \times 10^{-6} \text{m}^2$
Mild steel	450mm	$280 \times 10^{-6} \text{m}^2$

Table 1

Find the electromagnetic force, F required to create $286 \mu \text{Wb}$ for the magnetic circuit in **Figure 3**. Determine also the current, I if the coil of 500 turns are wound around the magnetic circuit. The magnetization curve is shown in **APPENDIX A**.

(15 marks/ markah)

a) Takrifkan istilah-istilah merujuk kepada litar magnet yang berikut:

- i) daya elektromagnet, F .
- ii) kekuatan medan magnet, H .
- iii) ketumpatan fluk, B .
- iv) enggan, S .
- v) ketelapan, μ .

b)

	Panjang min	Luas keratan rentas
Keluli tuang	350mm	$220 \times 10^{-6}m^2$
Keluli lembut	450mm	$280 \times 10^{-6}m^2$

Jadual 1

Tentukan jumlah daya gerak magnet, F yang diperlukan untuk menghasilkan urat daya sebanyak $286\mu Wb$ dalam litar magnet di dalam **Rajah 3**. Tentukan juga arus, I jika gegelung yang mempunyai 500 lilitan dililitkan di litar magnet tersebut. Rajah lengkung permagnetan ditunjukkan di dalam **LAMPIRAN A**.

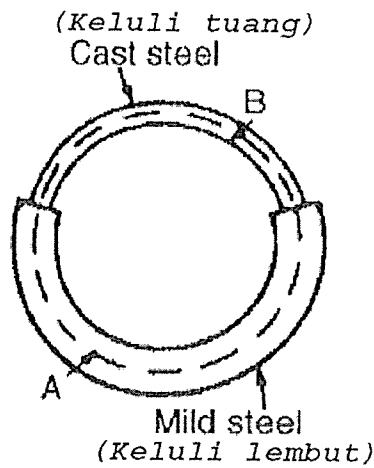


Figure 3 / Rajah 3

QUESTION 4 / SOALAN 4

a) Explain the definition of a step up transformer and a step down transformer.

(4 marks/ markah)

b)

	Open circuit test	Short circuit test
V	110V	9.5V
I	1.25A	25A
P	90W	140W

Table 2

The test data from a single phase 5KVA, 240V/110V transformer is shown in

Table 2. 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.

(21 marks/ markah)

a) Terangkan definisi bagi pengubah langkah naik dan pengubah langkah turun.

b)

	Ujian litar buka	Ujian litar pintas
V	110V	9.5V
I	1.25A	25A
P	90W	140W

Jadual 2

Data ujian untuk pengubah satu fasa 5KVA, 240V/110V adalah seperti **Jadual 2.**

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) .

QUESTION 5 / SOALAN 5

- a) A shunt field DC motor has a resistance field of 160Ω . It is connected to a 240V system. Calculate the armature current if the machine is in operation:
- i) as the generator load current 60A. Also find the value of the induced emf if armature resistance is 5.5Ω .
 - ii) as the motor load current is 40A. Also find the value of the induced emf if armature resistance is 5.5Ω .

(8 marks/ markah)

- b) A shunt field DC generator delivers a terminal voltage of 220V to a resistance load of 20Ω . The generator has field and armature resistances of 420Ω and 5Ω respectively, determine:
- the DC generator circuit.
 - the load current.
 - the field current.
 - the power at field.
 - the armature current.
 - induced emf at the armature.
 - the total power delivered to the load.

(15 marks/ markah)

- c) What is the difference between motor and generator?

(2 marks/ markah)

- a) Suatu mesin AT medan pirau mempunyai rintangan medan 160Ω . Ia disambungkan kepada sistem 240V. Kirakan arus angkir jika mesin beroperasi:

- sebagai penjana dengan arus beban 60A. Carikan nilai dge teraruh apabila rintangan angker adalah 5.5Ω .
- sebagai motor dengan arus beban 40A. Carikan nilai dge teraruh apabila rintangan angker adalah 5.5Ω .

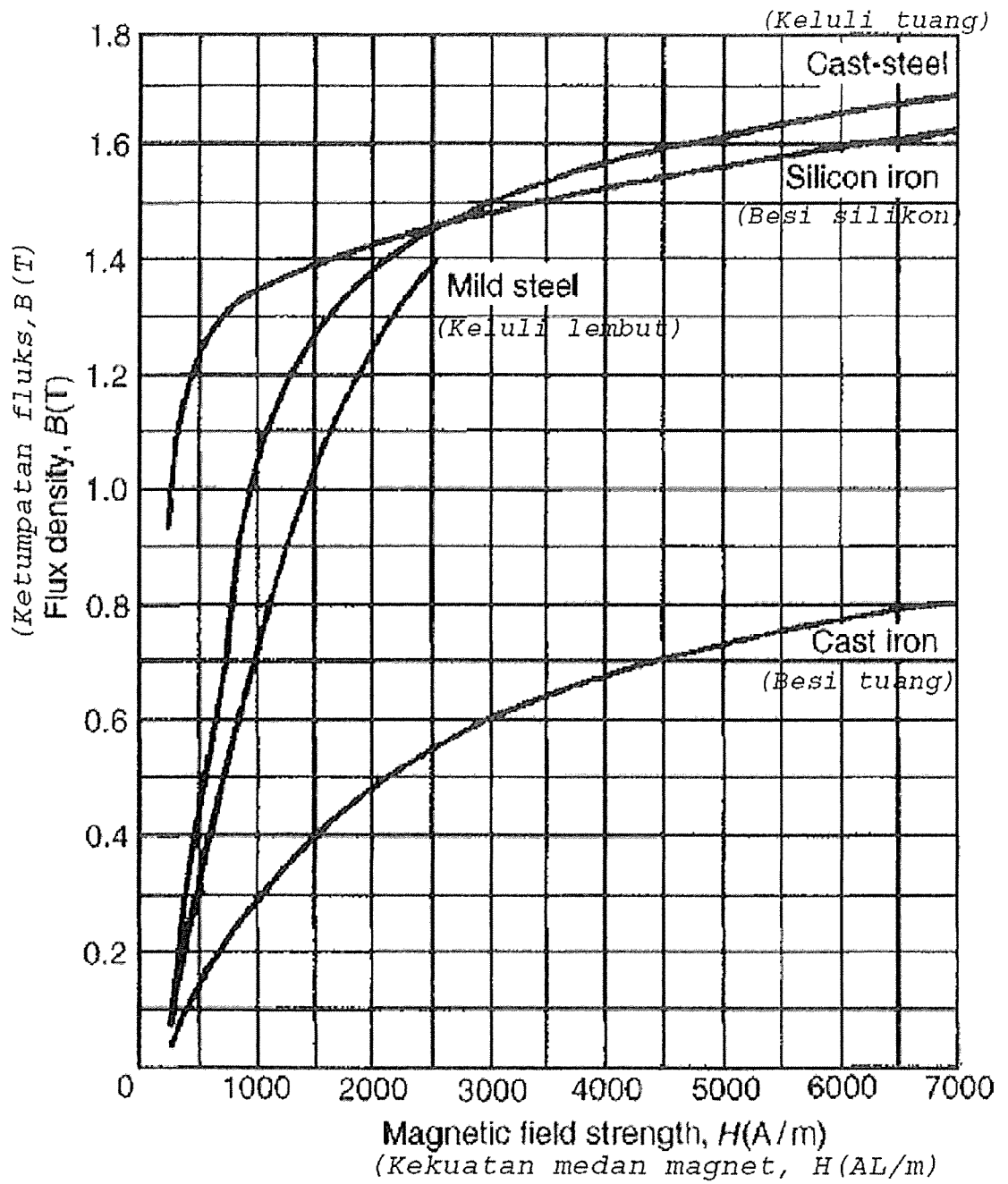
- b) Penjana AT medan pirau membekalkan voltan terminal sebanyak 220V kepada beban perintang sebanyak 20Ω . Penjana tersebut mempunyai rintangan medan dan angker sebanyak 420Ω dan 5Ω masing-masing, tentukan:

- litar bagi penjana AT.
- arus beban.
- arus medan.
- kuasa pada medan.
- arus angker.
- dge teraruh pada angker.
- jumlah kuasa yang dibekalkan kepada beban.

- c) Apakah perbezaan di antara motor dan penjana?

[100 MARKS / MARKAH]

APPENDIX A / LAMPIRANA



APPENDIX B / LAMPIRAN B

$$V = IZ$$

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

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

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

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

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

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

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

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

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

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

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

$$Dgm, F = Hl = NI$$

$$E = \phi n$$

END OF QUESTION PAPER/ KERTAS SOALAN TAMAT

1

2

3

