



**KOLEJ YAYASAN PELAJARAN JOHOR
FINAL EXAMINATION**

COURSE NAME : SEMICONDUCTOR DEVICES
COURSE CODE : DEE 1023
EXAMINATION : DECEMBER 2022
DURATION : 2 HOURS 30 MINUTES

**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 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 **7** printed pages including front page
*Kertas soalan ini mengandungi **7** halaman bercetak termasuk muka hadapan*

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This examination paper consists of **FOUR (4)** questions. Answer **ALL** the questions in the **Answering Booklet**.

*Kertas soalan ini mengandungi **FOUR (4)** soalan. Jawab **SEMUA** soalan dalam **Buku Jawapan**.*

QUESTION 1/ SOALAN 1

- a) Define semiconductor and state **three (3)** differences between conductor and insulator.

(6 marks/ *markah*)

- b) Explain the condition of the diode in **Figure 1 (a)** and **Figure 1 (b)**, which determine whether the diode is forward or reverse bias.

(8 marks/ *markah*)

- c) Briefly define the following:

- i) covalent bonding
- ii) valence electron

(6 marks/ *markah*)

- d) State **three (3)** advantages of LED in electronic circuits.

(6 marks/ *markah*)

- a) *Berikan definisi separuh pengalir dan nyatakan **tiga (3)** perbezaan di antara pengalir dan penebat.*

- b) *Terangkan keadaan diod dalam **Rajah 1 (a)** dan **Rajah 1 (b)**, sama ada diod pincang hadapan atau pincang balikan.*

c) Takrifkan secara ringkas perkara berikut:

- i) ikatan kovalen
- ii) elektron valens

d) Nyatakan tiga (3) kelebihan LED dalam litar elektronik.

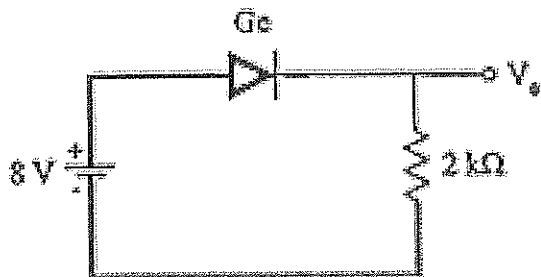


Figure 1 (a)/Rajah 1 (a)

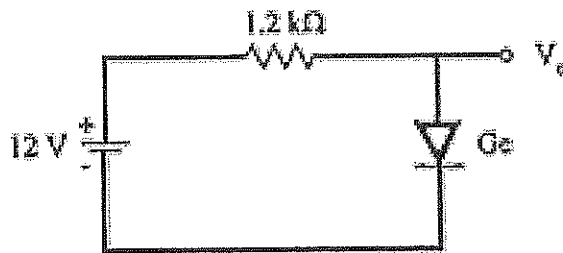


Figure 1 (b) /Rajah 1 (b)

QUESTION 2/ SOALAN 2

a) Referring to Figure 2 (a), calculate I and V_o .

(5 marks/ markah)

b) Determine I , V_{o1} and V_{o2} for the circuit in Figure 2 (b).

(12 marks/ markah)

c) Referring to Figure 2 (c), sketch the output waveform, v_o with reference to input waveform, v_i . Show your analysis in detail.

(8 marks/ markah)

a) Berdasarkan Rajah 2 (a), kira I dan V_o .

b) Tentukan I , V_{o1} dan V_{o2} untuk litar dalam Rajah 2 (b).

c) Berdasarkan *Rajah 2 (c)*, lakarkan gelombang keluaran, V_o dengan merujuk kepada gelombang masukan, V_{in} . Tunjukkan analisis anda dengan jelas.

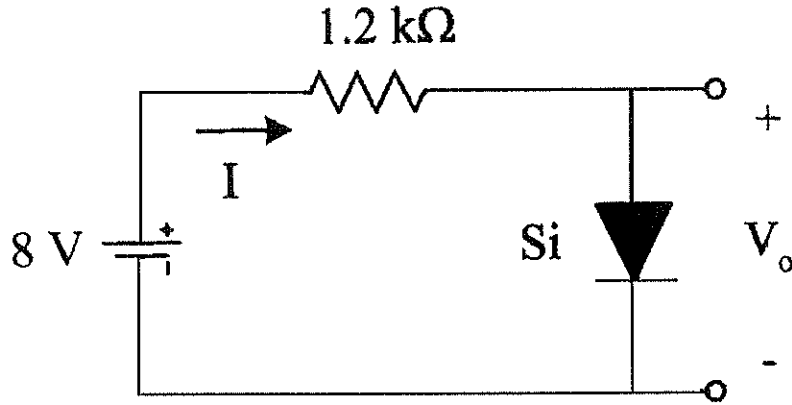


Figure 2 (a) /Rajah 2 (a)

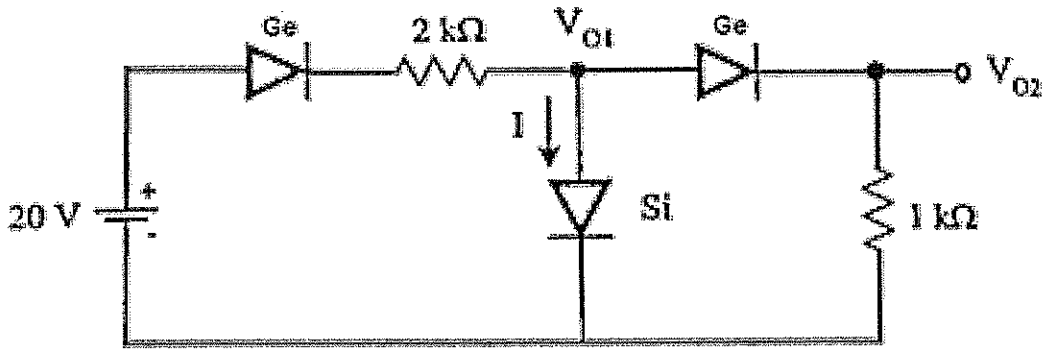


Figure 2 (b) /Rajah 2 (b)

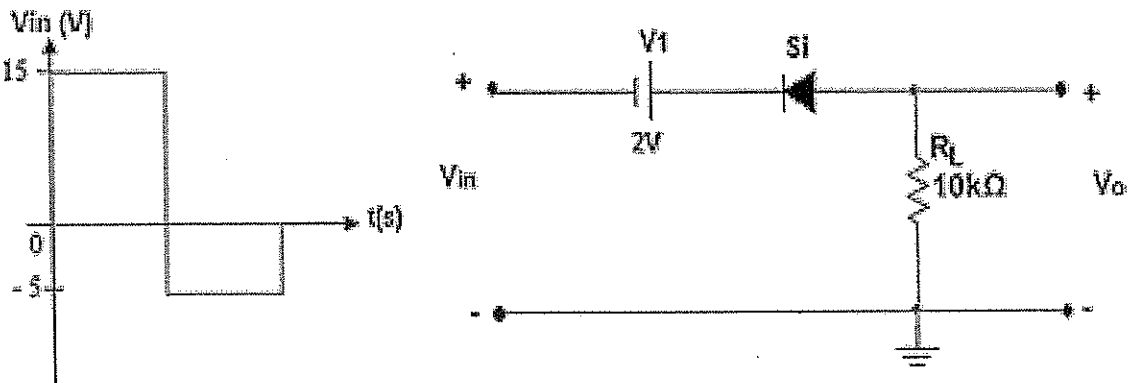


Figure 2 (c) /Rajah 2 (c)

QUESTION 3/ SOALAN 3

a) Referring to **Figure 3 (a)**, determine:

- i) base current, I_B .
- ii) collector current, I_C .
- iii) collector-emitter voltage, V_{CE} .
- iv) collector voltage, V_C .
- v) base voltage, V_B .

(11 marks/ markah)

b) **Figure 3 (b)** shows the load line and Q-point for the common emitter fixed-bias configuration.

- i) sketch and label the circuit. Determine the values of the unknown resistors.
- ii) determine I_{CQ} and β .

(14 marks/ markah)

a) Berdasarkan **Rajah 3 (a)**, tentukan:

- i) arus tapak, I_B .
- ii) arus pemungut, I_C .
- iii) voltan pemungut-pemancar, V_{CE} .
- iv) voltan pemungutr, V_C .
- v) voltan tapak, V_B .

b) **Rajah 3 (b)** menunjukkan litar beban dan titik-Q bagi konfigurasi pincang tetap pemancar sepunya.

- i) lakar dan labelkan litar. Tentukan nilai rintangan.
- ii) tentukan I_{CQ} dan β .

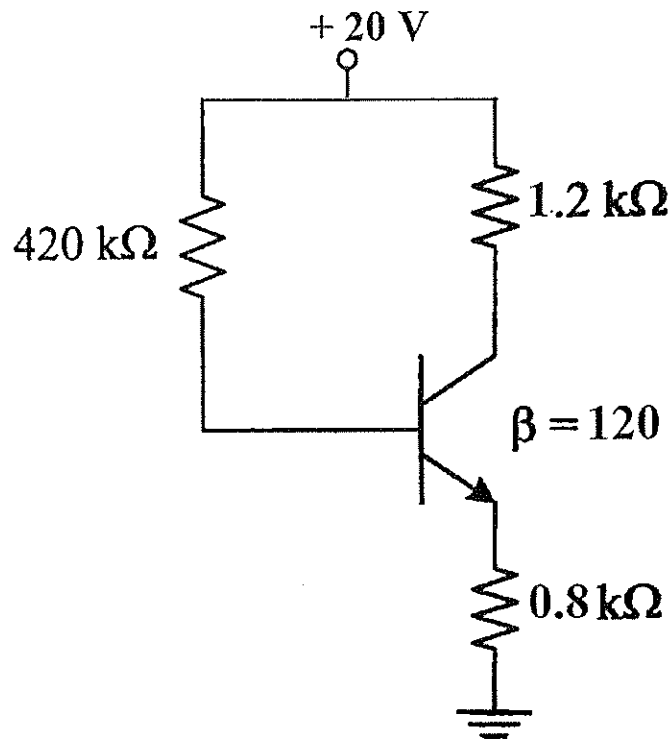


Figure 3 (a) /Rajah 3 (a)

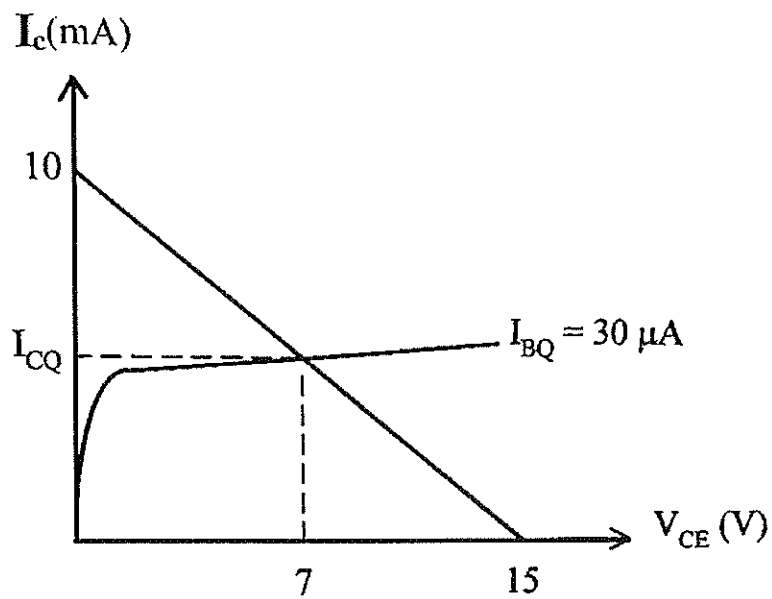


Figure 3 (b) /Rajah 3 (b)

QUESTION 4/ SOALAN 4

Based on Figure 4:

- i) sketch AC equivalent circuit using re model.
- ii) determine input impedance, Z_i .
- iii) determine output impedance, Z_o .
- iv) determine unloaded voltage gain, A_{VNL} .
- v) determine loaded voltage gain, A_{VL} .
- vi) determine the total voltage gain, A_{VS} .
- vii) determine current gain, A_i .

(25 marks/ markah)

Berdasarkan Rajah Q4:

- i) lakarkan litar setara AU dengan menggunakan model re.
- ii) tentukan galangan masukan, Z_i .
- iii) tentukan galangan keluaran, Z_o .
- iv) tentukan gandaan voltan tanpa beban, A_{VNL} .
- v) tentukan gandaan voltan dengan beban, A_{VL} .
- vi) tentukan jumlah gandaan voltan, A_{VS} .
- vii) tentukan gandaan arus, A_i .

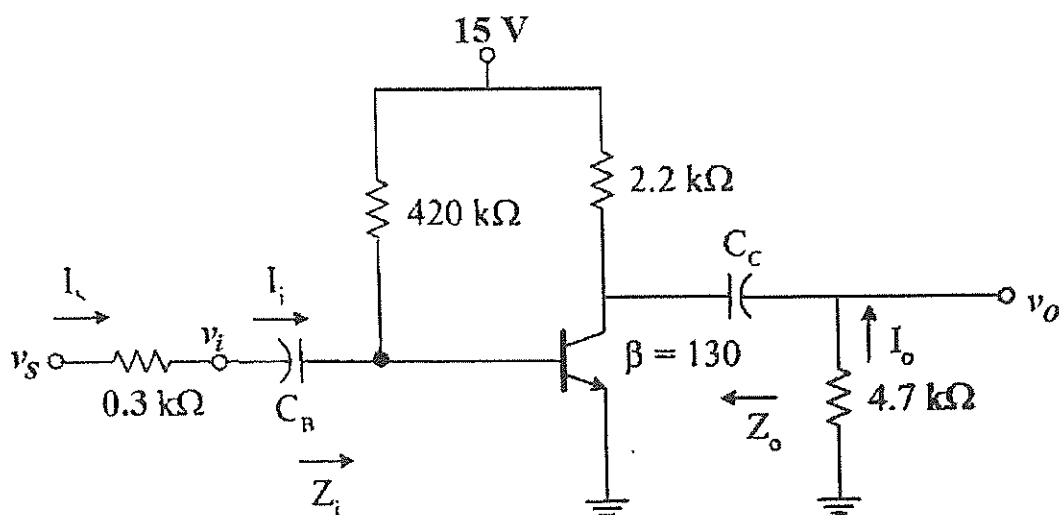


Figure 4 /Rajah 4

[100 MARKS/ MARKAH]

END OF QUESTION PAPER/ KERTAS SOALAN TAMAT

