KYPJ
KOLEJ YAYASAN PELAJARAN JOHOR

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FINAL EXAMINATION

COURSE NAME	:	**SEMICONDUCTOR DEVICES**
COURSE CODE	:	**DEE 1023**
EXAMINATION	:	**JANUARY 2024**
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.
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

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) Briefly explain the difference between conductor, insulator, and semiconductor in terms of the number of valence electrons in the valence shell of each material.

(6 marks/ *markah*)

b) With the aid of an appropriate diagram, describe a PN junction that is

i) forward bias.

ii) reverse bias.

(8 marks/ *markah*)

c) i) Draw and label completely the IV characteristics of a diode which is forward biased.

ii) Explain its characteristics.

(5 marks/ *markah*)

d) There are **two (2)** types of biasing in a diode. By using a LED, construct the schematic diagram and explain each of them accordingly.

(6 marks/ *markah*)

a) Terangkan secara ringkas perbezaan di antara pengalir, penebat, dan separuh pengalir dari segi bilangan elektron valens di dalam orbit luar setiap bahan.

b) Dengan bantuan gambar rajah yang sesuai, jelaskan simpang PN.

i) pincang hadapan.

ii) pincang balikan.

c) *i) Lukis dan label dengan lengkap ciri IV bagi sebuah diod pincang hadapan.*

ii) Terangkan ciri tersebut.

d) *Terdapat **dua (2)** jenis pincangan bagi sebuah diod. Dengan menggunakan LED, bina gambar rajah skematik yang sesuai dan terangkan.*

QUESTION 2/ *SOALAN 2*

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

(5 marks/ *markah*)

b) Determine I_1, I_2 , I_3, V_{01} and V_{02} 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_1, I_2 , I_3, V_{01} dan V_{02} untuk litar dalam **Rajah 2 (b)**.*

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

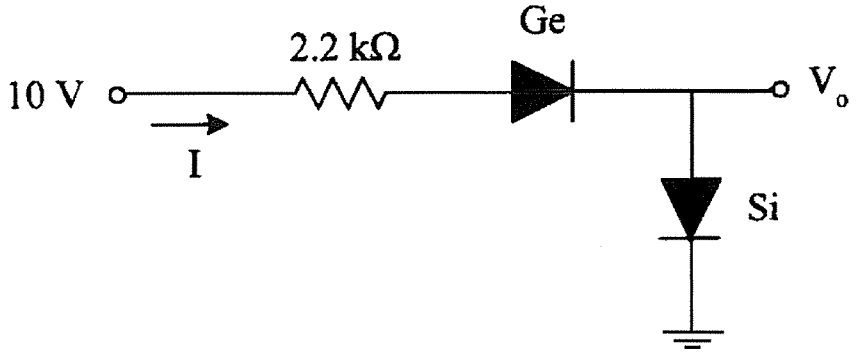

Figure 2 (a) /*Rajah 2 (a)*

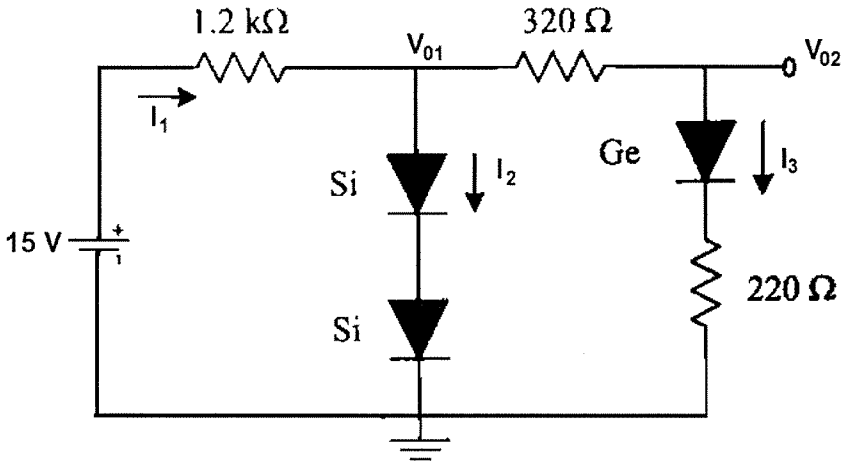

Figure 2 (b) /*Rajah 2 (b)*

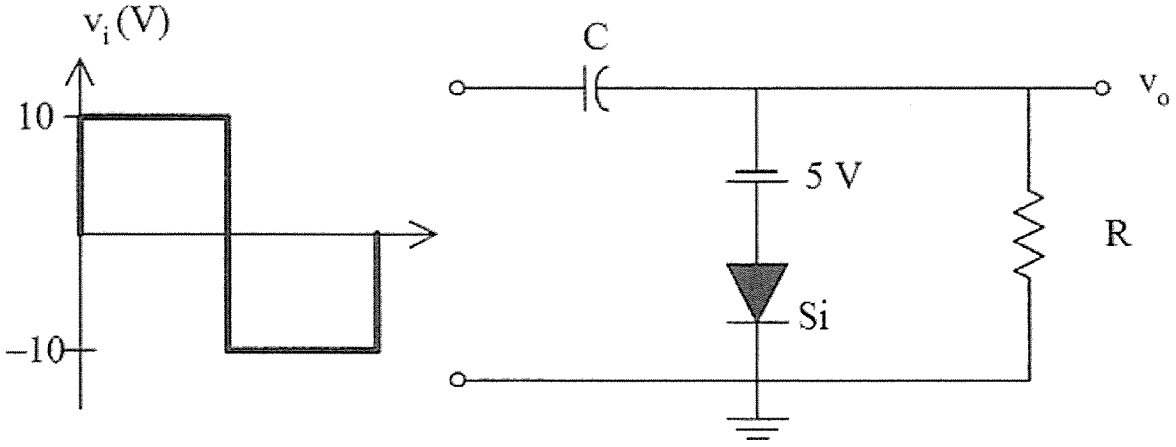

Figure 2 (c) /*Rajah 2 (c)*

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) Referring to **Figure 3 (b),** determine:
   i) base current, I_B.
   ii) base resistor, R_B.
   iii) collector voltage, V_C.
   iv) emitter voltage, V_E.
   v) collector-emitter voltage, V_{CE}.
   vi) base voltage, V_B.

(14 marks/ *markah*)

*a) Merujuk pada **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) Merujuk pada **Rajah 3 (b)**, tentukan:*
   i) arus tapak, I_B.
   ii) rintangan tapak, R_B.
   iii) voltan pemungut, V_C.
   iv) voltan pemancar, V_E.
   v) voltan pemungut-pemancar, V_{CE}.
   vi) voltan tapak, V_B.

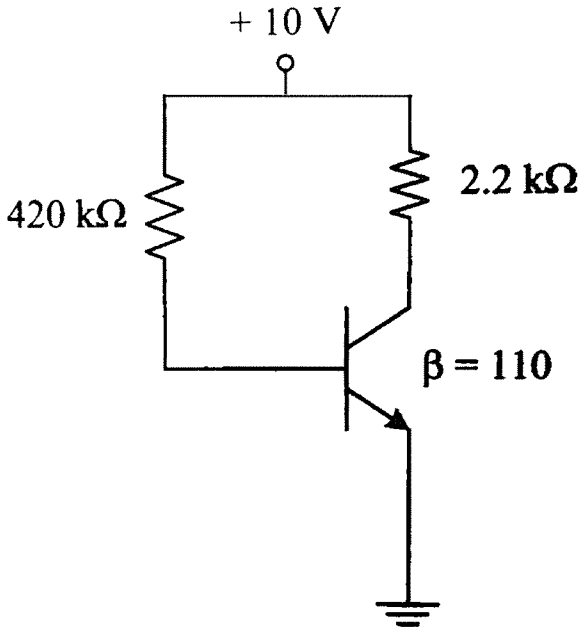

Figure 3 (a) */Rajah 3 (a)*

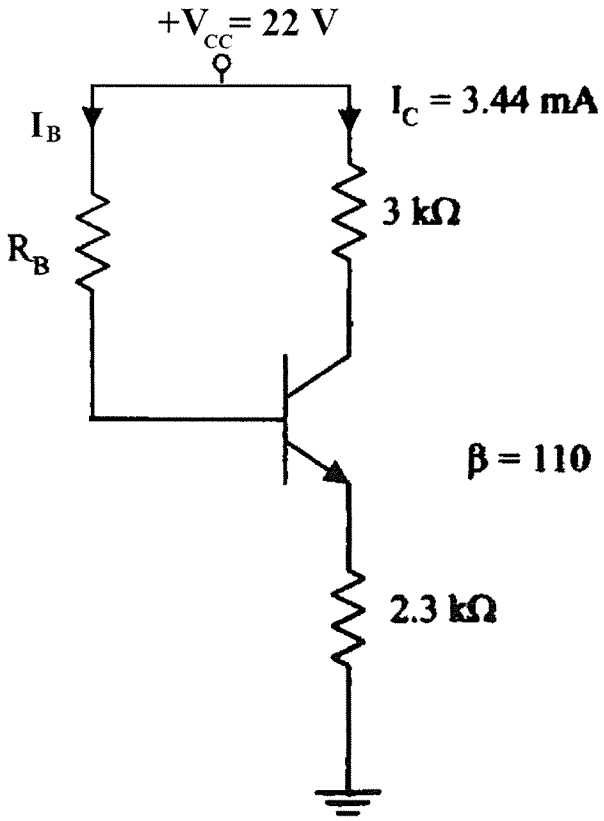

Figure 3 (b) */Rajah 3 (b)*

QUESTION 4/ *SOALAN 4*

Based on **Figure 4**:

i) sketch AC equivalent circuit using re model.
ii) determine input impedance, Zi.
iii) determine output impedance, Zo.
iv) determine voltage gain, Av.
v) determine current gain, Ai.
vi) given v_i = 10 sin ωt mV, sketch v_o with reference to v_i.

(25 marks/ *markah*)

*Berdasarkan **Rajah 4**:*

i) lakarkan litar setara AU dengan menggunakan model re.
ii) tentukan galangan masukan, Zi.
iii) tentukan galangan keluaran, Zo.
iv) tentukan gandaan voltan, Av.
v) tentukan gandaan arus, Ai.
vi) diberi v_i = 10 sin ωt mV, lakarkan v_o dengan merujuk kepada v_i.

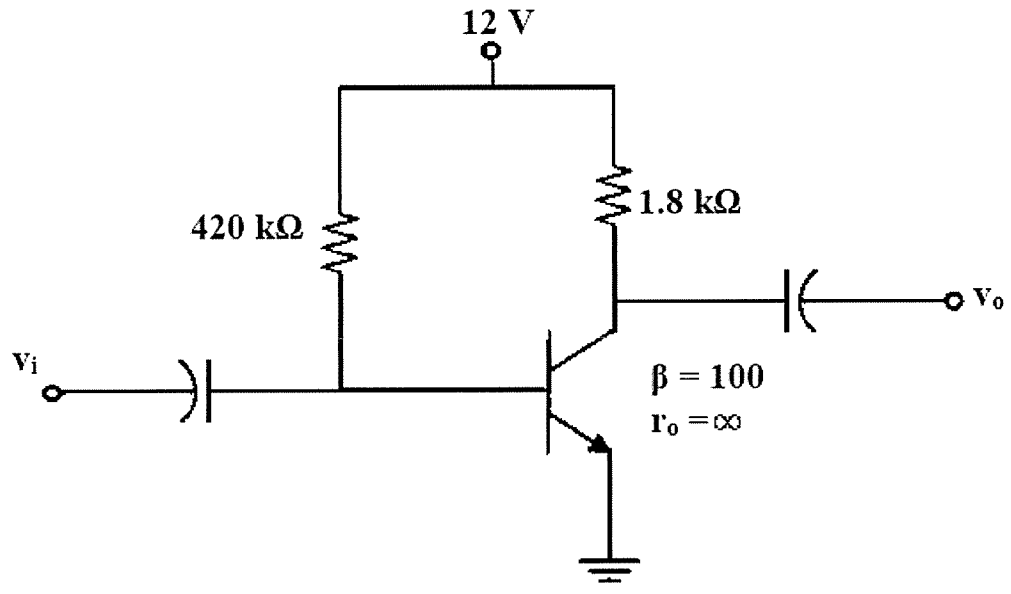

Figure 4 /*Rajah 4*

[100 MARKS/ *MARKAH*)

END OF QUESTION PAPER/ *KERTAS SOALAN TAMAT*