

4

SULIT



BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN ELEKTRIK

PEPERIKSAAN AKHIR
SESI DISEMBER 2015

DEE2023: SEMICONDUCTOR DEVICES

TARIKH : 10 APRIL 2016
TEMPOH : 2.30PM – 4.30PM (2 JAM)

Kertas ini mengandungi **SEBELAS (11)** halaman bercetak.

Bahagian A: Objektif (10 soalan)

Bahagian B: Struktur (4 soalan)

Bahagian C :Esei(2 soalan)

Dokumen sokongan yang disertakan : Tiada

JANGAN BUKA KERTAS SOALANINI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

SECTION A : 10 MARKS**BAHAGIAN A : 10 MARKAH****INSTRUCTION:**

This section consists of **TEN (10)** objective questions. Mark your answers in the OMR form provided.

ARAHAN :

Bahagian ini mengandungi SEPULUH (10) soalan objektif. Tandakan jawapan anda di dalam borang OMR yang disediakan.

CLO1
C1

1. Identify how many electrons are characterized by a valence shell for intrinsic semiconductor material.

Kenal pasti berapa bilangan elektron di valensi kelompang bagi bahan separuh pengalir intrinsik.

- A. 3
- B. 8
- C. 4
- D. 5

CLO1
C2

2. A P-N junction acts as a closed switch when it _____.

Simpang P-N menjadi seperti suis tertutup bila _____.

- A. cannot overcome its barrier voltage
tidak boleh melepas voltan sawar
- B. has a wide depletion region
mempunyai kawasan susutan yang luas
- C. is reversed biased
pincang balikan
- D. has a low junction resistance
mempunyai rintangan simpang yang rendah

- CLO1 3. Name the voltage of which current start to flow in a reverse biased P-N junction.

Nama voltan bila arus mula mengalir pada pincang balikan simpang P-N.

- A. Breakdown voltage
Voltan pecah tebat
- B. Barrier voltage
Voltan sawar
- C. Biasing voltage
Voltan pincangan
- D. Forward voltage
Voltan hadapan

- CLO2 4. If a 12V supply connected in forward biased, using a silicon diode and a 370Ω resistor in series. Calculate the value of voltage dropped across the diode.

Jika 12V disambung pincang hadapan, menggunakan diod silikon dan rintangan sesiri ialah 370Ω . Kirakan nilai bagi kejatuhan voltan yang merintangi diod.

- A. 0.3V
- B. 0.9V
- C. 1.4V
- D. 0.7V

- CLO1 5. List THREE (3) types of transistor configurations.

Senaraikan TIGA(3) jenis konfigurasi transistor.

- A. Common base, common drain and common source
Tapak sepunya, salir sepunya dan punca sepunya
- B. Common gate, common collector and common souce
Get sepunya, pemungut sepunya dan punca sepunya
- C. Common emitter, common base and common collector
Pemancar sepunya, tapak sepunya dan pemungut sepunya
- D. Common emitter, common base and common drain
Pemancar sepunya, tapak sepunya dan salir sepunya

- CLO2 6. Calculate the voltage gain if 2mV signal produces a 2V output.

- Kirakan gandaan voltan jika 2mV isyarat menghasilkan output 2V.*
- A. 0.001
 - B. 1000
 - C. 0.004
 - D. 100

- CLO1 7. In a feedback amplifier, if the feedback fraction β is positive, then the feedback is called _____.

Dalam penguat suap balik, jika pecahan suap balik β adalah positif maka suap balik tersebut di panggil _____.

- A. degenerative
merosot
- B. regenerative
jana semula
- C. negative
negatif
- D. positive
positif

- CLO1 8. State how many terminals of a JFET.

Nyatakan berapa jumlah terminal JFET.

- A. 1
- B. 2
- C. 3
- D. 4

CLO1
C2

9. Choose the **CORRECT** statement about the depletion mode MOSFET.

*Pilih kenyataan yang **BETUL** tentang MOSFET mod pengurangan.*

- A. Can operate with only positive gate voltages.
Boleh beroperasi dengan hanya voltan get positif.
- B. Can operate with positive as well as negative gate voltages.
Boleh beroperasi dengan positif dan juga voltan get negatif.
- C. Can operate with only negative gate voltages.
Boleh beroperasi dengan hanya voltan get negatif.
- D. Cannot operate in the ohmic region.
Tidak beroperasi pada kawasan ohm.

CLO1
C1.

10. Define a Silicon Controlled Rectifier (SCR).

Tentukan mengenai Penerus Terkawal Silikon (SCR).

- A. a PNPN thyristor with 3 terminals.
thyristor PNPN dengan 3 terminal.
- B. a PNP thyristor with 3 terminals.
thyristor PNP dengan 3 terminal.
- C. a NPN thyristor with 3 terminals.
thyristor NPN dengan 3 terminal.
- D. a PNPN thyristor with 4 terminals.
thyristor PNPN dengan 4 terminal.

SECTION B : 60 MARKS**BAHAGIAN B : 60 MARKAH****INSTRUCTION:**

This section consists of **FOUR (4)** structured questions. Answer **ALL** questions.

ARAHAN:

Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab semua soalan.

QUESTION 1**SOALAN 1**CLO1
C1

- a) State **THREE (3)** particles contained in the atom.

*Nyatakan **TIGA (3)** partikel yang terdapat di dalam atom.*

[3 marks]

[3 markah]

CLO1
C2

Describe **FIVE (5)** characteristics of N-type semiconductor.

*Terangkan **LIMA (5)** ciri-ciri semikonduktor jenis N.*

[5 marks]

[5 markah]

CLO2
C3

- b) Illustrate the meaning of forward biased voltage and reverse biased voltage supplied across a P-N junction.

Gambarkan maksud voltan pincang hadapan dan voltan pincang balikan yang dibekalkan pada simpang P-N.

[7 marks]

[7 markah]

QUESTION 2**SOALAN 2**

CLO1

C1

- a) Draw the schematic symbol and physical structure for P-Channel of JFET.

Lukiskan simbol skematik dan struktur binaan bagi P-Channel JFET.

[3 marks]

[3 markah]

CLO2

C2

- b) Describe **THREE (3)** characteristics of N-channel JFET.

*Jelaskan **TIGA (3)** ciri-ciri N-channel JFET.*

[5 marks]

[5 markah]

CLO2

C3

- c) Draw the NMOS circuit as switch (using open and closed switch).

Lukiskan litar NMOS sebagai suis (menggunakan suis terbuka dan tertutup).

[7 marks]

[7 markah]

QUESTION 3**SOALAN 3**CLO1
C2

- a) Explain the purpose of multi-staging/cascading amplifier.

Terangkan tujuan penguat berbilang peringkat.

[3 marks]

[3 markah]

CLO2
C3

- b) Draw the frequency response curve of a single stage and multistage amplifier in a same graph.

Lukiskankan lengkuk sambutan frekuensi bagi penguat satu peringkat dan berbilang peringkat di dalam graf yang sama.

[6 marks]

[6 markah]

CLO2
C3

- c) A multistage amplifier employs five stages, each has a power gain of 30. Determine the total gain of the amplifier in dB. If a negative feedback of 10dB is employed, find the resultant gain.

Sebuah penguat berbilang peringkat mempunya lima peringkat yang setiap satunya mempunyai gandaan kuasa sebanyak 30. Tentukan gandaan keseluruhan penguat di dalam unit dB. Jika satu suap balik negatif sebanyak 10dB diberikan, kirakan gandaan yang terhasil.

[6 marks]

[6 markah]

QUESTION 4**SOALAN 4**CLO1
C1

- a) Sketch the symbols of SCR, DIAC and UJT.

Lakarkan simbol-simbol bagi SCR, DIAC dan UJT.

[3 marks]

[3 markah]

CLO1
C3

- b) Draw a simple Lamp Dimmer Circuit using TRIAC as a controller switch.

Lukiskan satu Litar Pemalap Lampu ringkas menggunakan TRIAC sebagai suis kawalan.

[5 marks]

[5 markah]

CLO2
C3

- c) Draw the Silicon Controlled Rectifier (SCR) as a two Bipolar Junction Transistor (BJT) and explain the operation.

Lukiskan Penerus Terkawal Silikon (SCR) sebagai dua Transistor Dwi Kutub (BJT) dan terangkan operasinya.

[7 marks]

[7 markah]

SECTION C : 30 MARKS**BAHAGIAN C : 30 MARKAH****INSTRUCTION:**

This section consists of TWO (2) essay questions. Answer ALL questions.

ARAHAN:

Bahagian ini mengandungi DUA (2) soalan eseai. Jawab SEMUA soalan.

QUESTION 1**SOALAN 1**

CLO2
C3

Based on figure C1, construct the DC load line and find the maximum undistorted output signal amplitude for the common emitter configuration. Given the value of $\beta = 60$ and $V_{BE} = 0.3V$. (Show all calculations)

Berdasarkan rajah C1, lakarkan garis beban AT dan cari nilai isyarat amplitud keluaran tidak terpesong yang maksimum bagi konfigurasi pemancar sepunya Diberi nilai $\beta = 60$ dan $V_{BE} = 0.3V$. (Tunjukkan semua pengiraan)

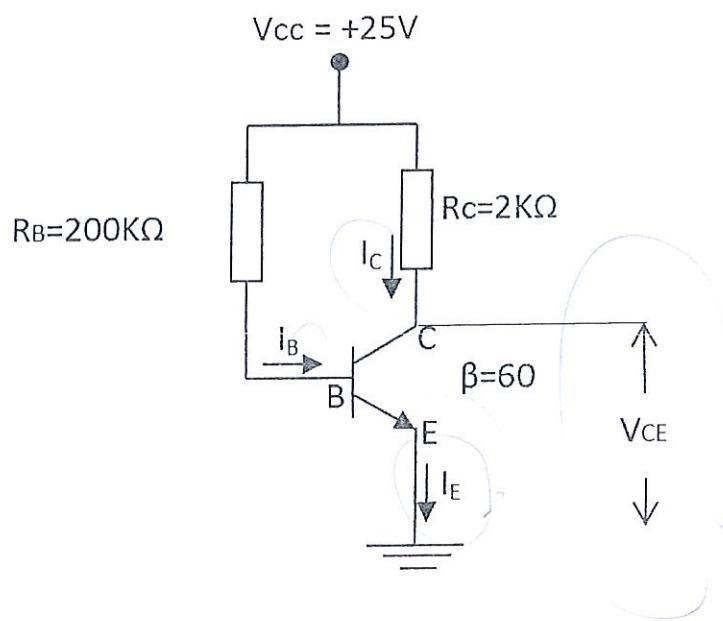


Figure C1 / Rajah C1

[15 marks]

[15 markah]

QUESTION 2**SOALAN 2**CLO2
C3

A Full-wave Rectifier (Bridge) operates with a silicon diode. Draw the circuit and explain the operation of the circuit.

Satu Penerus Gelombang penuh (Titi) beroperasi menggunakan diod silikon. Lukiskan litar tersebut dan terangkan tentang kendalian litar itu.

[15 marks]

[15 markah]

SOALAN TAMAT



BAHAGIAN PEPERIKSAAN DAN PENILAIAN

BORANG JAWAPAN OBJEKTIF

JUMLAH MARKAH

JABATAN		TARIKH	
NO SIRI BUKU JAWAPAN		PROGRAM	
KOD & NAMA KURSUS			

Arahan : Sila hitamkan pilihan jawapan anda

 A B C D

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2 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	22 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	42 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D
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4 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	24 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	44 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D
5 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	25 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	45 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D
6 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	26 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	46 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D
7 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	27 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	47 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D
8 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	28 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	48 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D
9 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	29 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	49 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D
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20 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	40 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	60 <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D

HAKMILIK UNIT PEPERIKSAAN

TIDAK DIBENARKAN MEMBAWA BORANG JAWAPAN INI KELUAR DARIPADA BILIK/DEWAN PEPERIKSAAN