



UNIVERSITI SAINS MALAYSIA

Final Examination
2016/2017 Academic Session

May/June 2017

JIF 216 - Electronics I
[Elektronik I]

Duration : 3 hours
[Masa : 3 jam]

Please ensure that this examination paper contains **ELEVEN** printed pages before you begin the examination.

Answer **ALL** questions. You may answer **either** in Bahasa Malaysia or in English.

Read the instructions carefully before answering.

Each question carries 20 marks.

In the event of any discrepancies in the exam questions, the English version shall be used.

*Sila pastikan bahawa kertas peperiksaan ini mengandungi **SEBELAS** muka surat yang bercetak sebelum anda memulakan peperiksaan ini.*

*Jawab **SEMUA** soalan. Anda dibenarkan menjawab soalan **sama ada** dalam Bahasa Malaysia atau Bahasa Inggeris.*

Baca arahan dengan teliti sebelum anda menjawab soalan.

Setiap soalan diperuntukkan 20 markah.

Sekiranya terdapat sebarang percanggahan pada soalan peperiksaan, versi Bahasa Inggeris hendaklah diguna pakai.

1. (a) Define briefly the following p-n junction diode state:

- (i) Forward-bias
- (ii) Reverse-bias

(4 marks)

(b) Determine V_o for the circuit in Figure 1 (a) and 1 (b).

(6 marks)

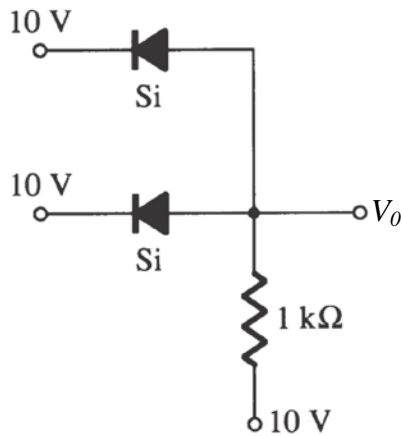


Figure 1 (a)

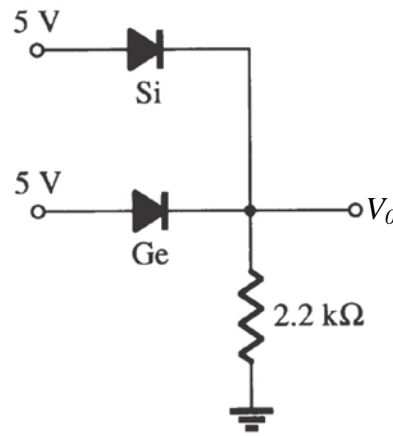


Figure 1 (b)

(c) Determine v_o in Figure 2 (a) and 2 (b).

(10 marks)

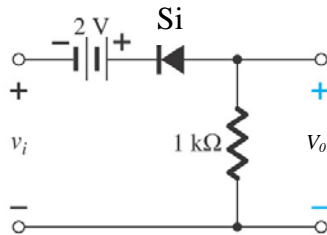
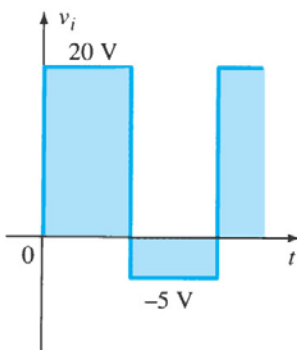


Figure 2 (a)

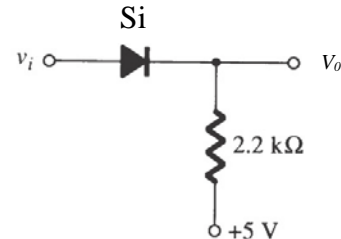


Figure 2 (b)

2. (a) What is the source of the leakage current in a transistor?
(2 marks)
- (b) Show the notation and symbols used for the transistor configurations of
(i) common base.
(ii) common emitter.
(iii) common collector.
(12 marks)
- (c) (i) Given $\alpha_{dc} = 0.998$, determine I_C if $I_E = 4 \text{ mA}$.
(2 marks)
- (ii) Find α_{dc} if $I_E = 2.8 \text{ mA}$ and $I_B = 20 \mu\text{A}$.
(2 marks)
- (iii) Determine I_E if $I_B = 40 \mu\text{A}$ and $\alpha_{dc} = 0.998$.
(2 marks)

3. For the network in Figure 3, determine

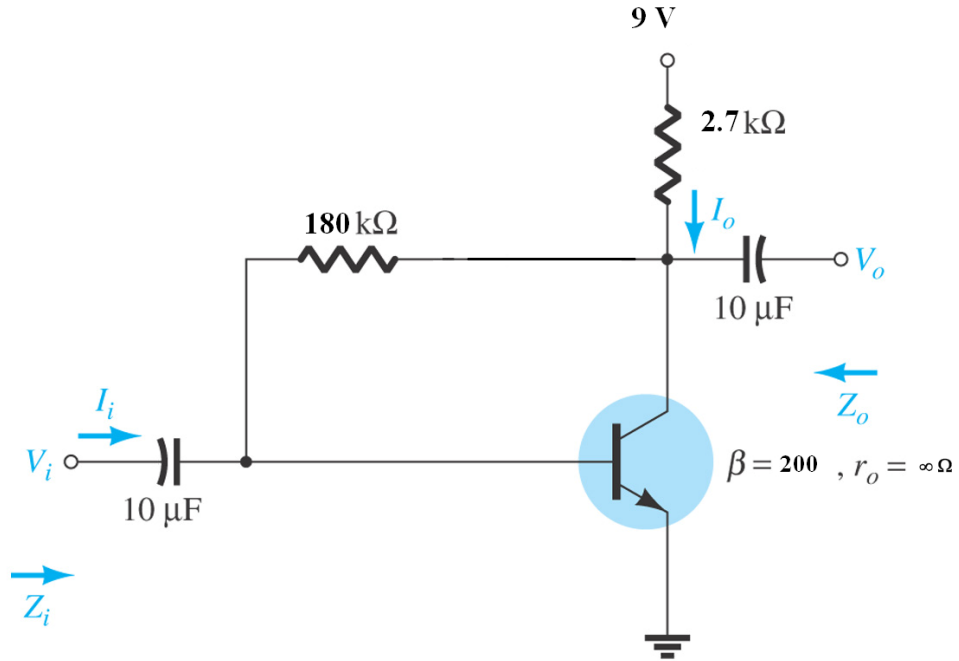


Figure 3

(a) r_e .

(8 marks)

(b) Z_i, Z_o and A_v .

(12 marks)

4. Determine Z_i , Z_o , and V_o for the network in Figure 4 if $V_i = 20\text{ mV}$.

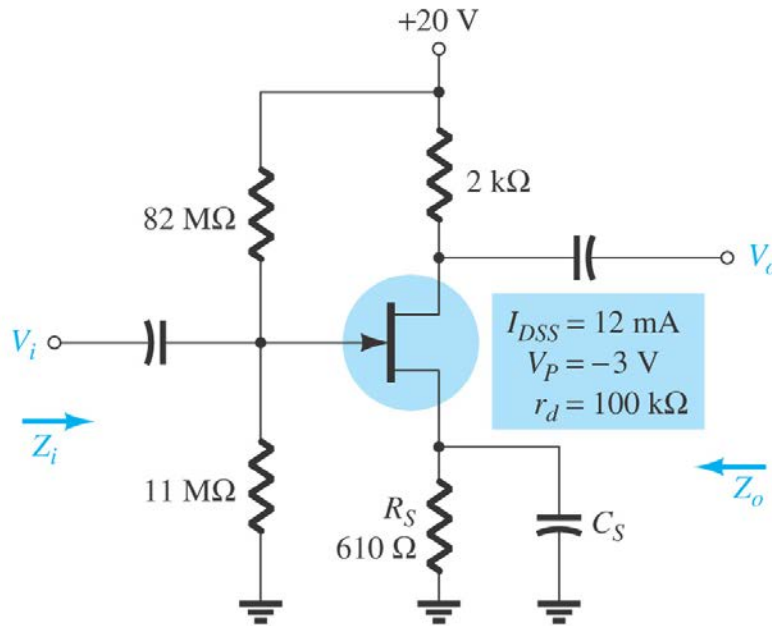


Figure 4

(20 marks)

5. (a) Draw the circuit and symbol of the basic differential amplifier. Briefly describe on the possible input signal combinations and the resulting output.

(9 marks)

- (b) (i) Determine the output for the circuit in Figure 5 with components $R_f = 100\text{ k}\Omega$, $R_1 = 100\text{ k}\Omega$, $R_2 = 20\text{ k}\Omega$, and $R_3 = 20\text{ k}\Omega$

(4 marks)

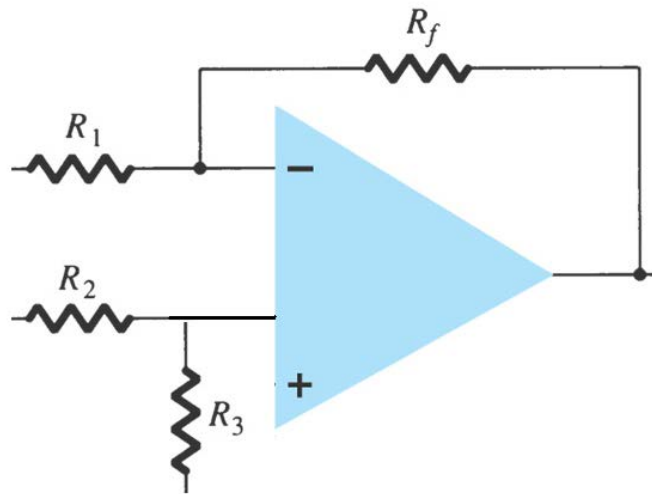


Figure 5

- (ii) Draw a circuit that can provide subtraction of two signals, using only one op-amp stage. Write the resulting output voltage.

(7 marks)

1. (a) Terangkan secara ringkas keadaan satu diod simpangan p-n:

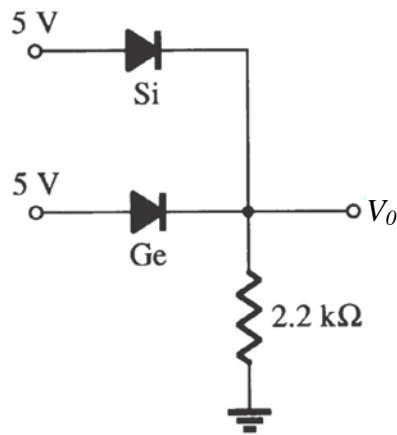
(i) Pincangan depan

(ii) Pincang songsang

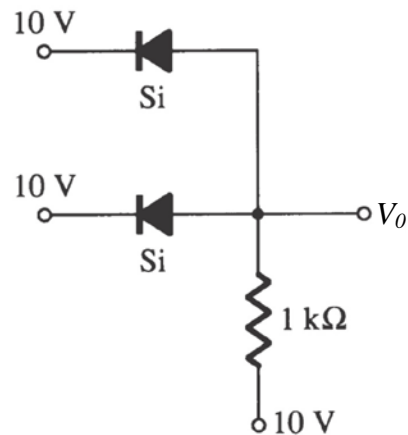
(4 markah)

(b) Tentukan V_o untuk litar-litar pada Rajah 1(a) dan 1(b).

(6 markah)



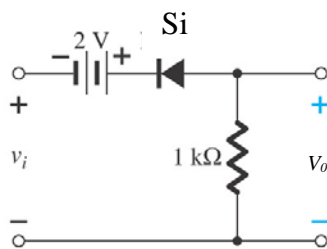
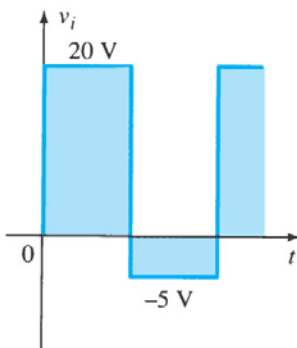
Rajah 1(a)



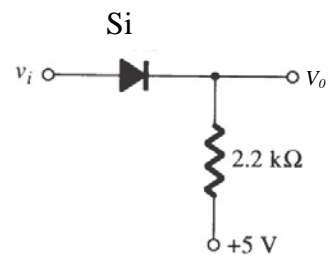
Rajah 1(b)

(c) Tentukan v_o pada Rajah 2 (a) dan 2 (b).

(10 markah)



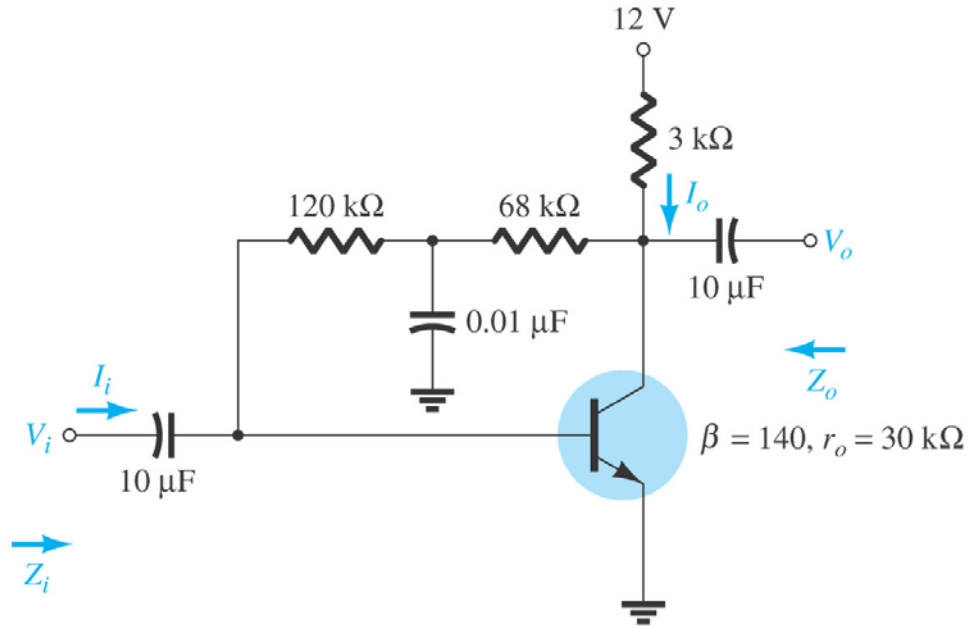
Rajah 2 (a)



Rajah 2 (b)

2. (a) *Apakah punca arus bocor di dalam transistor?*
(2 markah)
- (b) *Tunjukkan tatatanda dan simbol-simbol yang digunakan bagi konfigurasi-konfigurasi transistor:*
(i) *tapak sepunya,*
(ii) *pemancar sepunya,*
(iii) *pengumpul sepunya.*
(12 markah)
- (c) (i) *Diberi suatu $\alpha_{dc} = 0.998$, tentukan I_C jika $I_E = 4 \text{ mA}$.*
(2 markah)
- (ii) *Carikan α_{dc} jika $I_E = 2.8 \text{ mA}$ dan $I_B = 20 \mu\text{A}$.*
(2 markah)
- (iii) *Tentukan I_E jika $I_B = 40 \mu\text{A}$ dan $\alpha_{dc} = 0.998$.*
(2 markah)

3. Berdasarkan rangkaian pada Rajah 3, tentukan



Rajah 3

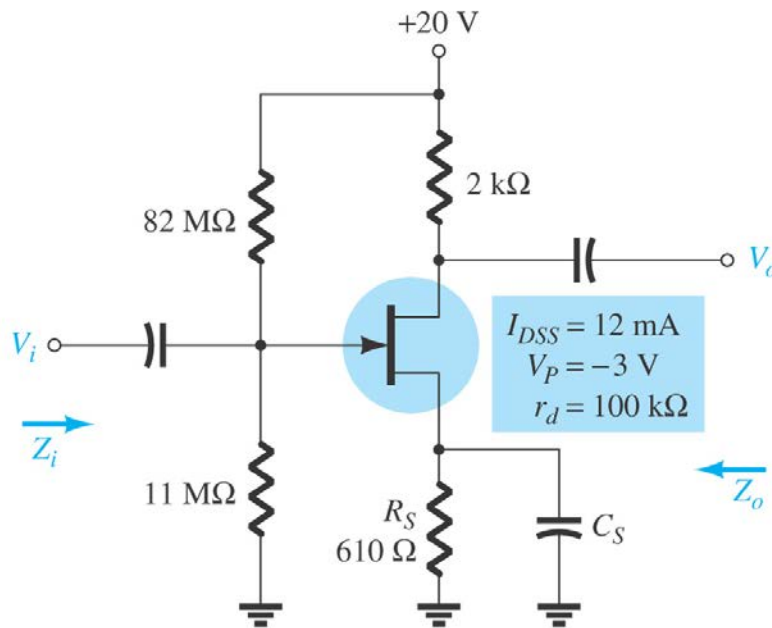
(a) r_e .

(8 markah)

(b) Z_i , Z_o dan A_v .

(12 markah)

4. Tentukan Z_i , Z_o , dan V_o bagi litar di Rajah 4 jika $V_i = 20\text{mV}$.



Rajah 4

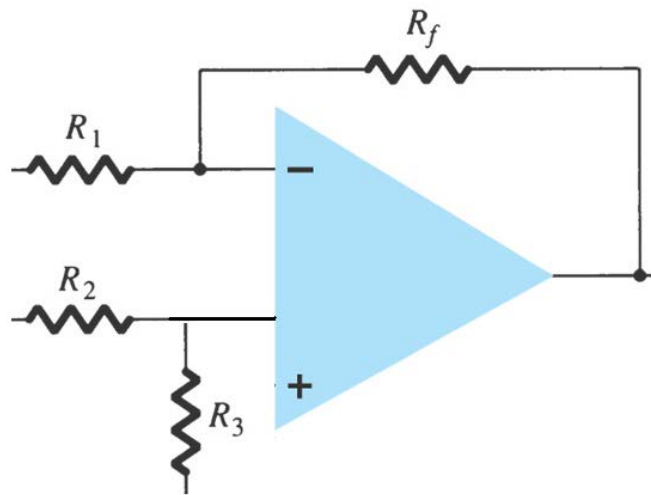
(20 markah)

5. (a) Lukis litar dan simbol suatu amplifiler pembeza asas. Perihalkan secara ringkas tentang kombinasi isyarat input yang mungkin dan hasilan output.

(9 markah)

- (b) (i) Tentukan output untuk litar pada Rajah 5 dengan komponen $R_f = 100\text{ k}\Omega$, $R_1 = 100\text{ k}\Omega$, $R_2 = 20\text{ k}\Omega$, and $R_3 = 20\text{ k}\Omega$

(4 markah)



Rajah 5

- (ii) Lukiskan satu litar yang boleh memberikan penolakan dua isyarat, dengan hanya menggunakan satu tahap op-amp. Tuliskan hasilan voltan output.

(7 markah)