UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: BMT 1043
COURSE	: ELECTRONICS
SEMESTER/SESSION	: 2-2023/2024
DURATION	: 3 HOURS

Instructions:

1. This booklet contains 4 questions. Answer **ALL** the questions.
2. All answers should be written in answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise your hands and ask the invigilator.

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

THIS BOOKLET CONTAINS 8 PRINTED PAGES INCLUDING COVER PAGE

QUESTION 1

a) Answer the following questions:

i. List **three (3)** types of material classification. (3 marks)

ii. Give an example for every material classification. (3 marks)

b) Draw the reversed bias diode circuit. (3 marks)

c) A silicon diode is connected in DC series configuration as shown in Figure 1. Determine:

i. The current ***I*** (4 marks)

ii. The voltage at V_1 (2 marks)

iii. The voltage at V_2 (2 marks)

iv. The voltage at V_o (2 marks)

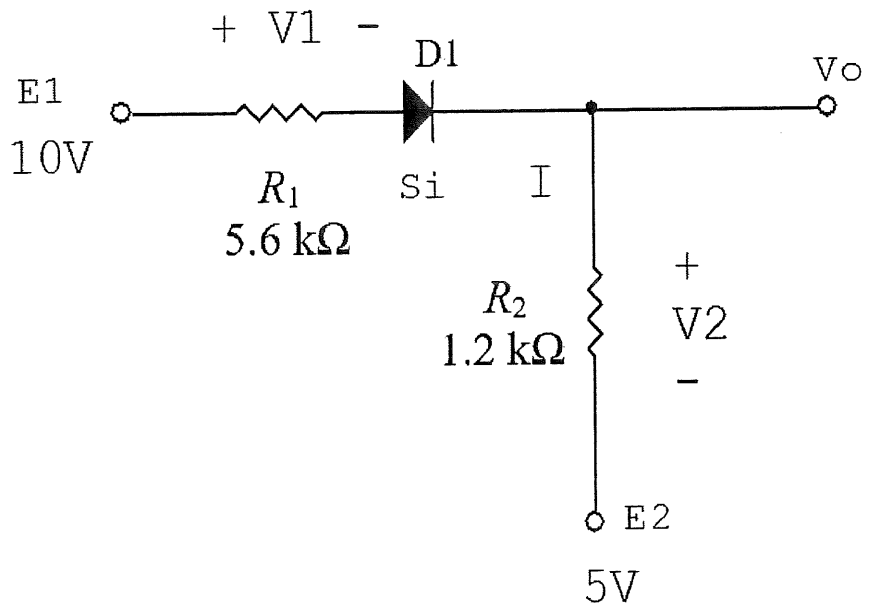

Figure 1

QUESTION 2

a) Figure 2 shows some parts of a power supply circuit. Assume that the diodes $D_1 - D_4$ are silicon:

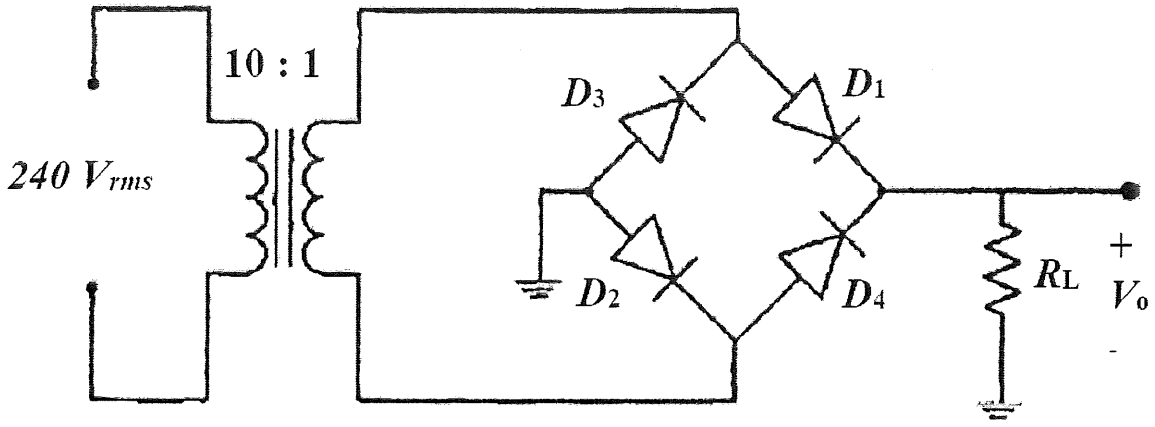

Figure 2

i. State the function of the bridge network $D_1 - D_4$ (2 marks)

ii. Explain briefly the operation of the bridge network (6 marks)

iii. Sketch the waveform at the output, V_o (4 marks)

b) Figure 3 shows the major parts of a power supply unit. Draw the output waveform at point A, B, C, and D. (5 marks)

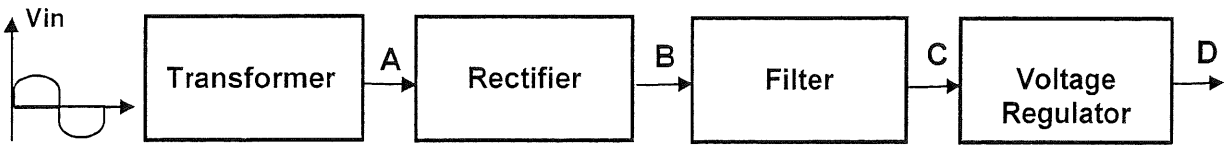

Figure 3

c) A bipolar junction transistor is a combination of two junction diode from a P-type material and N-type of material. Answer the following questions:

i. Draw a PNP and NPN transistor that connected to the battery and show the current flow of each of the transistor accordingly (4 marks)

ii. Figure 4 show a bipolar junction transistor circuit. Given that V_O = 4V, β= 150 and V_{BE} = 0.7V. Determine the voltage at V_s (7 marks)

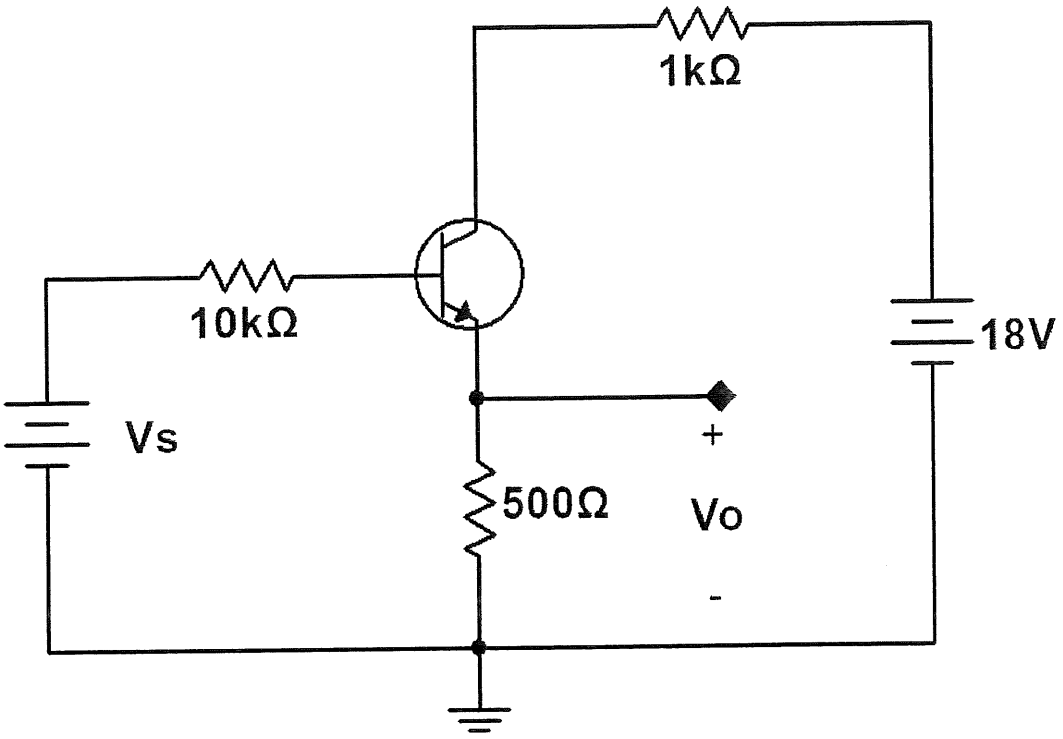

Figure 4

d) For the circuit shown in Figure 5, given, β_{ac} = **120**. Answer all the followings:

i. Solve the **Q**-point (I_{CQ} and V_{CEQ}). (5 marks)

ii. Compute the emitter voltage, V_E. (2 marks)

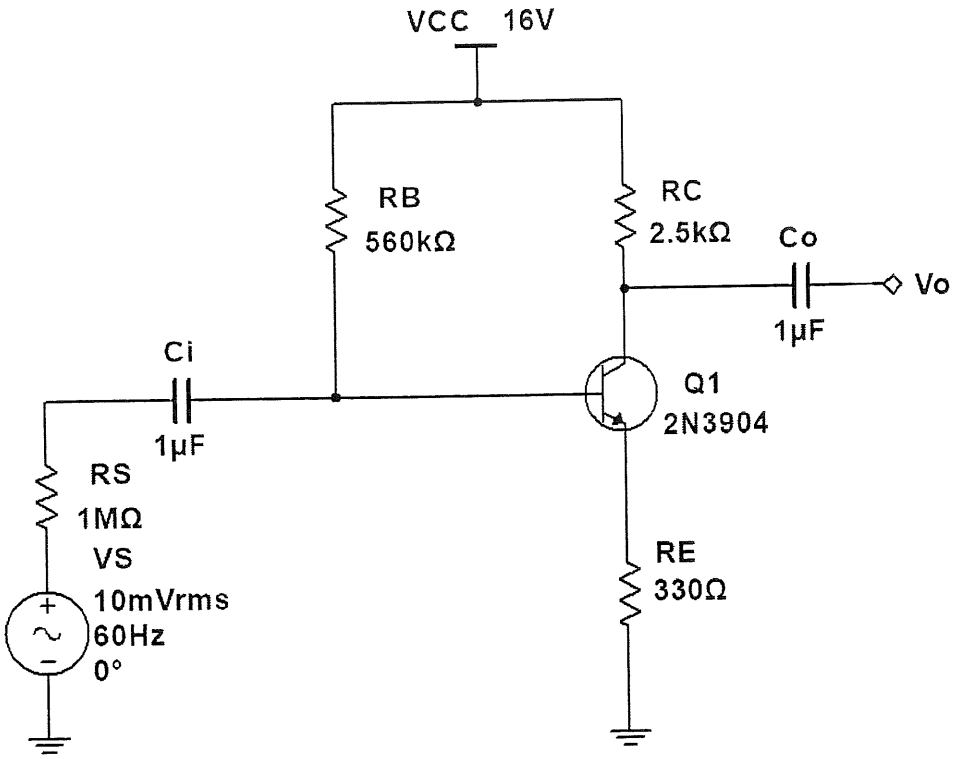

Figure 5

QUESTION 3

a) Express **three (3)** operation modes available for bipolar junction transistor **(BJT)**. (3 marks)

b) Figure 6 shows a collector characteristic curve for the Q-point operation for the **fixed-bias network**.

i. Find the Q-point (I_{CQ} and V_{CEQ}). (2 marks)

ii. Determine the value of V_{CC} (3 marks)

iii. Determine the value of R_B and R_C. (6 marks)

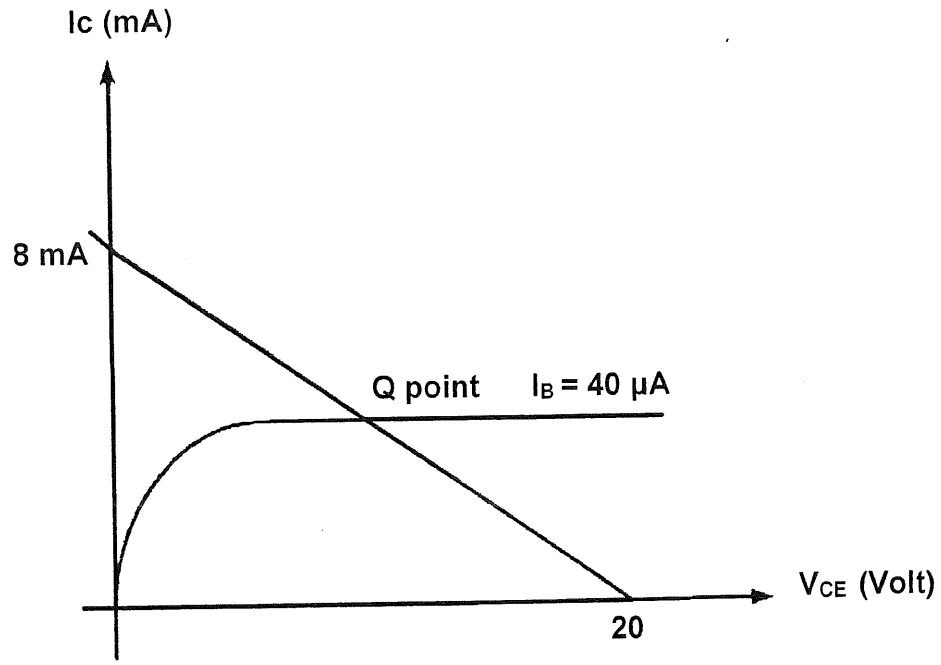

Figure 6

QUESTION 4

a) The input impedance, Z_i to a common-emitter transistor amplifier as shown in Figure 7 is 1.2 kΩ with β= 120

i. Draw an AC equivalent circuit. (2 marks)

ii. Calculate the impedance, r_e (2 marks)

iii. Calculate the base current, I_b if V_i = 30 mV (4 marks)

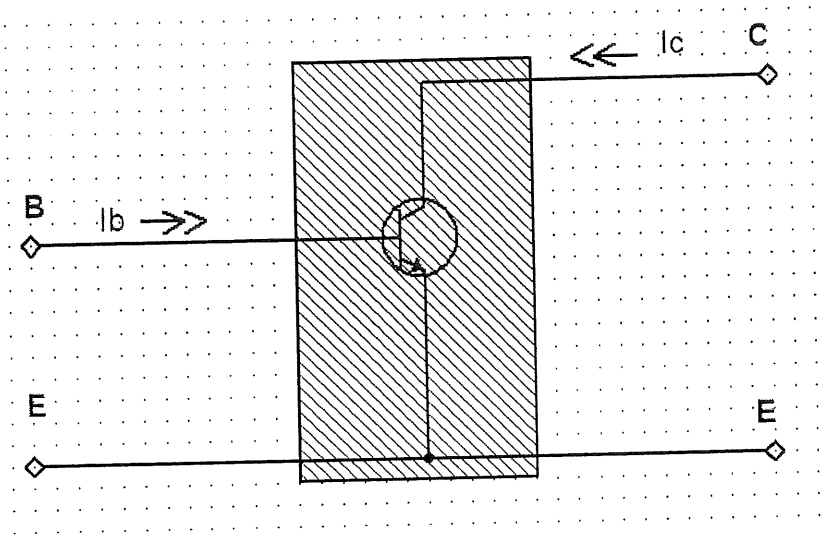

Figure 7

b) Answer the following questions:

i. Describe the term dc beta (β) and dc alpha (α). (3 marks)

ii. Describe the relationship between α and β. (2 marks)

c) Refer to the voltage divider system of Figure 8. Given **β = 150**.

i. Compute the **Q**-point (I_{CQ} and V_{CEQ}) (8 marks)

ii. Compute base voltage, V_B and emitter voltage, V_E. (3 marks)

iii. Find the value of r_e. (2 marks)

iv. Draw the ac equivalent circuit for the network of Figure 7. (2 marks)

v. Analyze the voltage gain, $A_V = V_{out}/V_{in}$. (4 marks)

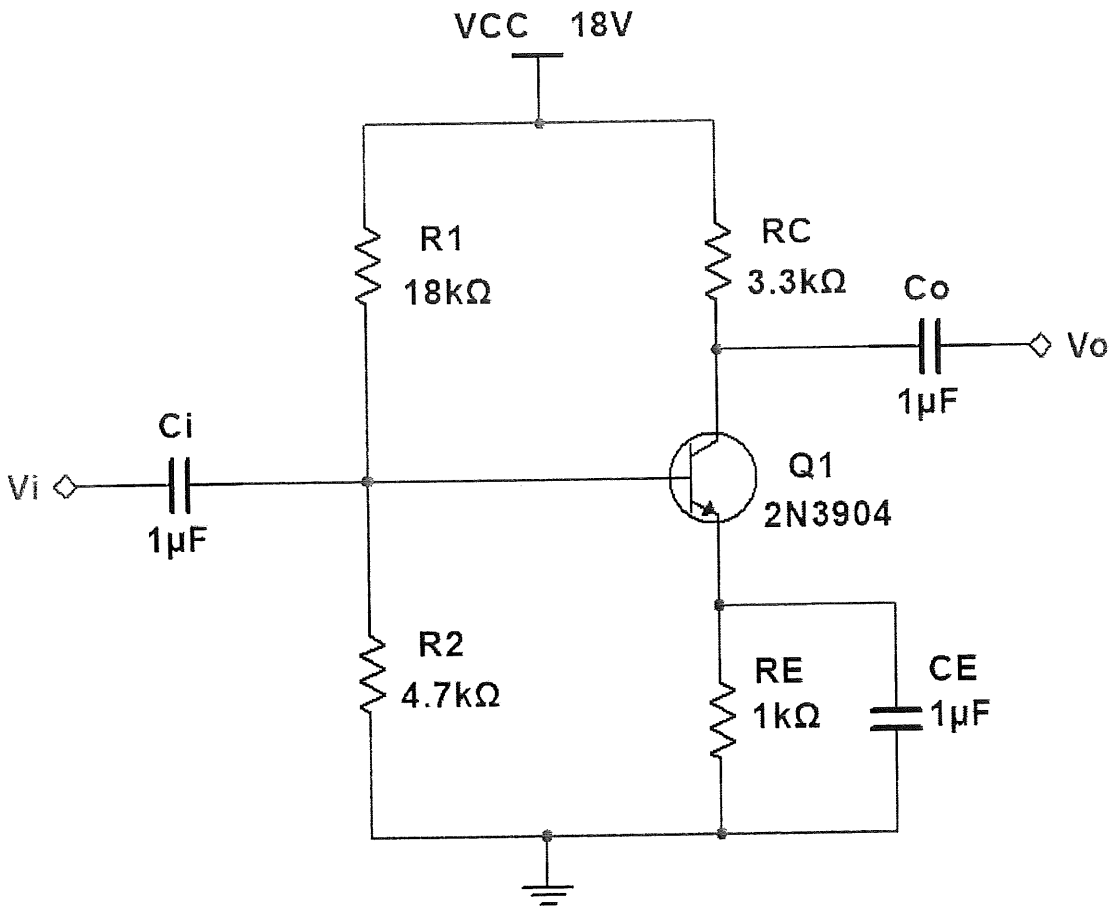

Figure 8

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