

**UNIVERSITY COLLEGE TATI (UC TATI)****FINAL EXAMINATION QUESTION BOOKLET**

COURSE CODE	: BMT 1043
COURSE	: ELECTRONICS
SEMESTER/SESSION	: 2-2024/2025
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 7 PRINTED PAGES INCLUDING COVER PAGE

QUESTION 1

- a) Answer the following questions: (2 marks)
- i. Describe the meaning of semiconductors. (2 marks)
 - ii. List two (2) types of charge carriers in semiconductors. (2 marks)
- b) Explain the concepts of doping process in semiconductors. (3 marks)
- c) Answer the following questions: (2 marks)
- i. Describe the function of diode. (2 marks)
 - ii. Illustrate the symbol for diode. (2 marks)
- d) In the operation of bipolar junction transistor, there are three transistor currents which are I_E , I_C and I_B .
- i. Define which of current is always the largest and which one is the smallest. (2 marks)
 - ii. State which two currents are relatively close in magnitude. (2 marks)

QUESTION 2

- a) 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:
- Illustrate a PNP and NPN transistor that connected to the battery and show the current flow of each of the transistor accordingly. (4 marks)
 - Figure 1 show a bipolar junction transistor circuit. Given that $V_O = 6V$, $\beta = 120$ and $V_{BE} = 0.7V$. Determine the voltage at V_s . (7 marks)

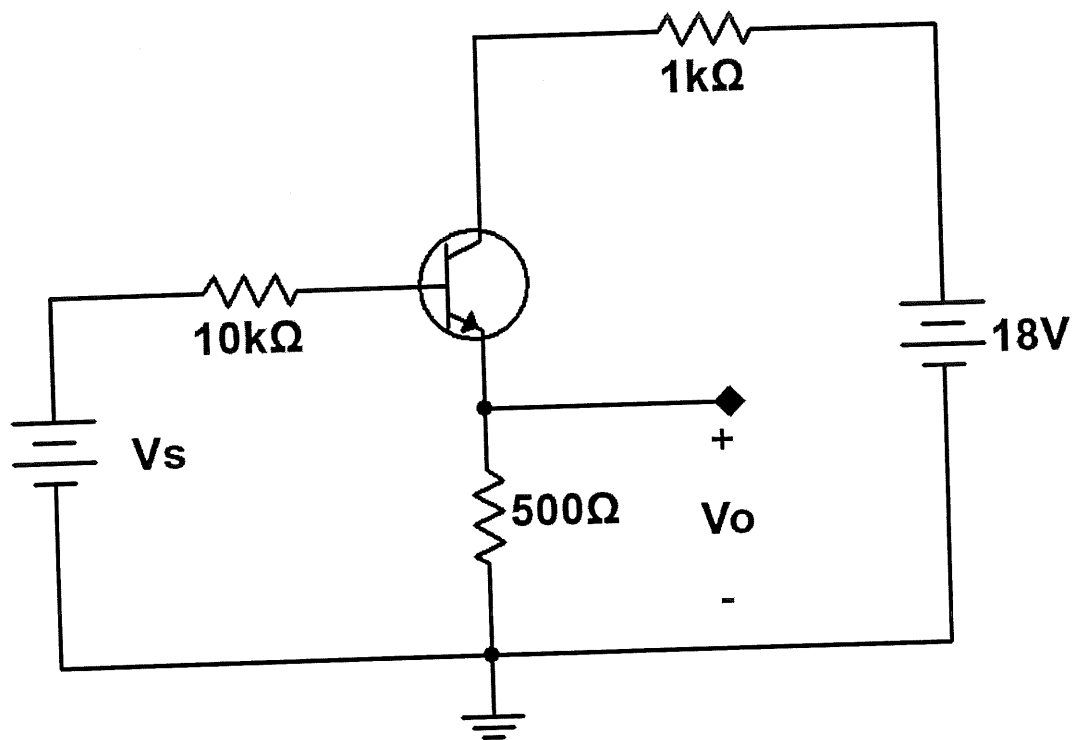


Figure 1

b) Answer the following questions:

- i. Describe the term dc beta (β) and dc alpha (α). (4 marks)
- ii. Describe the relationship between α and β . (3 marks)

c) For the circuit in Figure 2, answer all the following :

- i. Compute the value for Beta, β . (4 marks)
- ii. Compute the voltage supply, V_{CC} . (3 marks)
- iii. Compute the Base resistor, R_B . (3 marks)

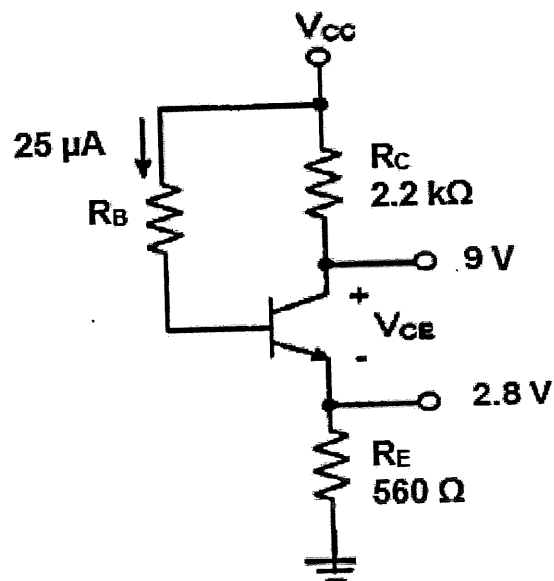
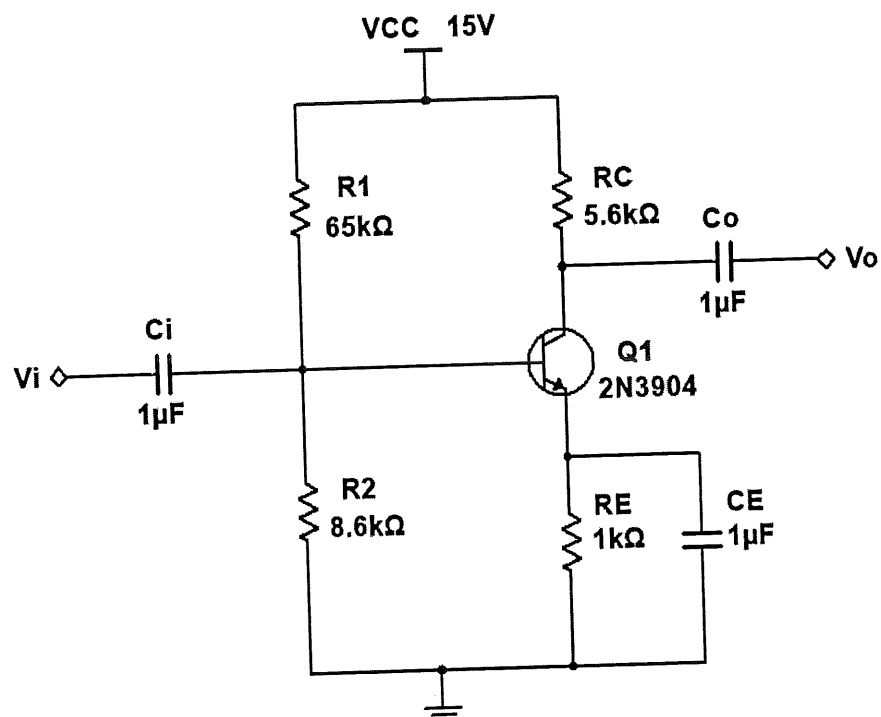


Figure 2

QUESTION 3

- a) Express **three (3)** operation modes available for bipolar junction transistor (**BJT**). (3 marks)
- b) Describe the biasing combination of base-emitter (**BE**) junction and base-collector (**BC**) junction to be operated in cut-off, active and saturation regions. (6 marks)
- c) Refer to the voltage divider system of Figure 3. Given $\beta = 250$. (10 marks)
- Calculate the **Q-point** (I_{CQ} and V_{CEQ}). (2 marks)
 - Calculate base voltage, V_B . (2 marks)
 - Calculate emitter voltage, V_E . (2 marks)

**Figure 3**

QUESTION 4

- a) Answer the following questions:
- i. List **two (2)** types of Field Effect Transistor, **FET**. (2 marks)
 - ii. Illustrate the basic structure of N-type junction field effect transistor, **JFET**. (3 marks)
 - iii. Explain the basic operation of N-types junction field effect transistor, **JFET** circuit. (6 marks)
- b) List **three (3)** types of biasing in junction field effect transistor, **JFET** circuits. (3 marks)
- c) Sketch the transfer characteristics graph for the **JFET** transistor by using $I_{DSS} = 10\text{mA}$ and $V_P = -4\text{V}$. (5 marks)

d) Figure 4 shows a FET amplifier circuit. Given that the saturation current ($I_{DSS} = 12 \text{ mA}$) and cut-off voltage ($V_p = -6 \text{ V}$).

- Name the bias configuration in the Figure 4. (2 marks)
- Using the mathematical approach only, express the operating point, I_{DQ} and V_{GSQ} , for the network. (5 marks)
- Estimate the voltage gate, V_{GG} and the voltage source, V_s . (6 marks)
- Calculate the voltage drain to source, V_{DS} . (2 marks)

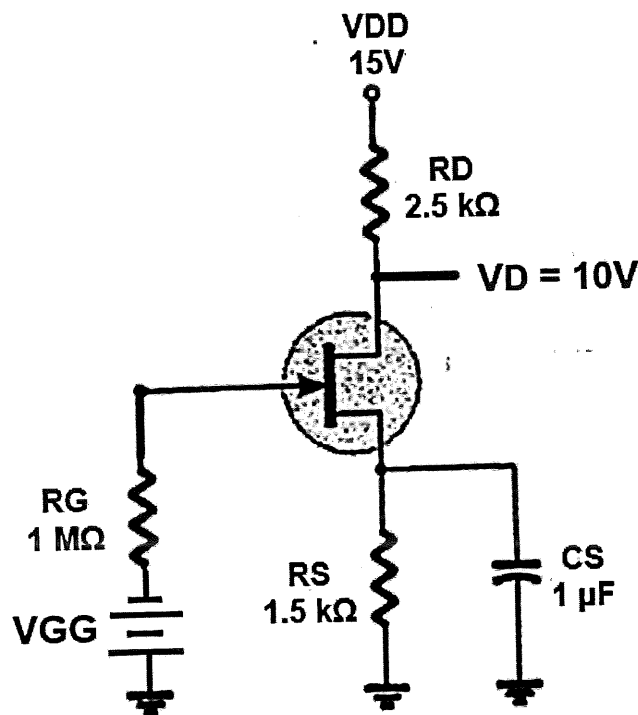


Figure 4

-----End of question-----

