

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

COURSE CODE	:	BMT 1043
COURSE	:	ELECTRONICS
SEMESTER / SESSION	:	01 - 2023/2024
DURATION	:	3 HOURS

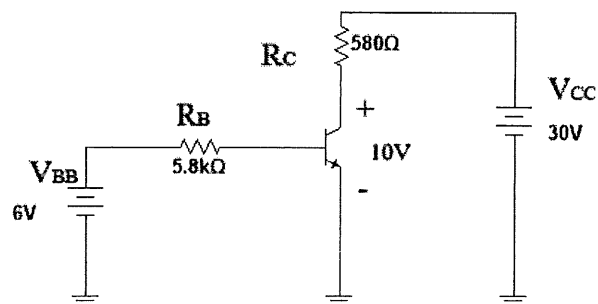
Instructions:

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

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO**THIS BOOKLET CONTAINS 6 PRINTED PAGES INCLUDING COVER PAGE**

QUESTION 1

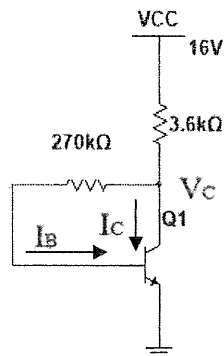
- a) Give the definition of a transistor. (3 marks)
- b) List the two (2) basic types of transistors. (2 marks)
- c) Draw the basic construction of an NPN BJT transistor. (6 marks)
- d) Based on the BJT amplifier circuit as shown in **Figure 1**:

**Figure 1**

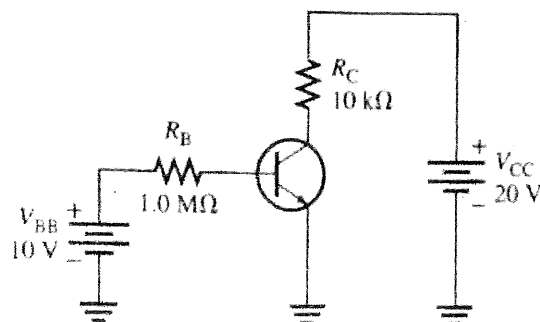
- i) Calculate the base current, I_B . (3 marks)
- ii) Calculate the collector current, I_C . (3 marks)
- iii) Calculate the emitter current, I_E . (3 marks)

QUESTION 2

- a) Explain the three (3) states of BJT operation. (9 marks)
- b) List the three (3) DC biasing circuits of a BJT. (3 marks)
- c) Referring to the BJT collector feedback configuration shown in **Figure 2**:

**Figure 2**

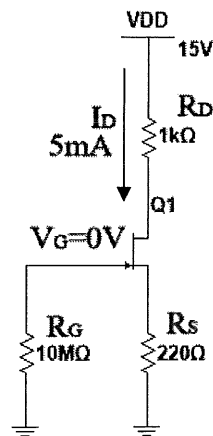
- i) Determine the collector current, I_C . (3 marks)
- ii) Determine the base current, I_B . (2 marks)
- iii) Determine the collector voltage, V_c . (2 marks)
- d) Based on the BJT circuit as shown in **Figure 3**:

**Figure 3**

- i) Calculate the change of V_{BB} supply to bias the transistor with $I_B = 20 \mu\text{A}$.
(3 marks)
- ii) Calculate the collector current, I_C , and the collector-emitter voltage, V_{CE} , at the Q-point, given that $\beta_{DC} = 50$.
(5 marks)
- iii) Calculate the collector current saturation, I_{CSAT} .
(3 marks)

QUESTION 3

- a) Give the definition of a FET. (4 marks)
- b) Give the two (2) types of FET. (2 marks)
- c) Illustrate the basic construction of a p-channel JFET transistor. (4 marks)
- d) List the two (2) types of JFET bias circuits. (2 marks)
- e) Based on the JFET circuit as shown in **Figure 4**, if the drain current, $I_D = 5 \text{ mA}$:

**Figure 4**

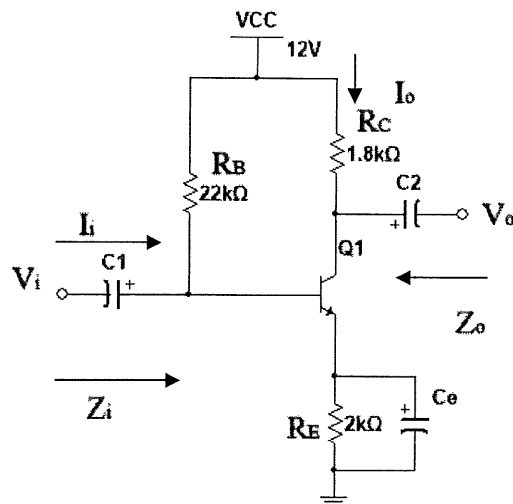
- i) Calculate the drain-source voltage, V_{DS} . (6 marks)
- ii) Calculate the gate-source voltage, V_{GS} . (2 marks)
- iii) Calculate the internal input resistance, R_{IN} , if the gate reverse current, $I_{GSS} = -2 \text{ nA}$ and gate-source voltage, $V_{GS} = -20 \text{ V}$. (2 marks)
- f) Give the two (2) basic types of MOSFETs. (2 marks)
- g) Show the two (2) structures of Depletion MOSFETs. (6 marks)

QUESTION 4

a) Explain the purpose of dc biasing of a transistor.

(3 marks)

b) Based on the common-emitter amplifier circuit shown in **Figure 5**:
Given $\beta = 120$.

**Figure 5**

i) Explain the function of coupling capacitors C_1 and C_2 in the circuit.

(3 marks)

ii) Calculate the base current, I_B .

(3 marks)

iii) Calculate the emitter current, I_E .

(3 marks)

iv) Calculate the emitter resistance, r_e .

(3 marks)

v) Calculate the input impedance, Z_i .

(3 marks)

vi) Calculate the output impedance, Z_o .

(2 marks)

-----End of Questions-----