UNIVERSITY COLLEGE TATI

UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: DEI 1013
COURSE	: ELECTRONICS
SEMESTER (SESSION)	: 1 – 2021/2022
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 13 PRINTED PAGES INCLUDING COVER PAGE

QUESTION 1

a) Briefly describe with your own words the definition for the followings:

i. Conductor. (2 marks)

ii. Semiconductor. (2 marks)

b) Refer to Figure 1, name three (3) regions as indicated by A, B and C for the PN Junction of a semiconductor. (3 marks)

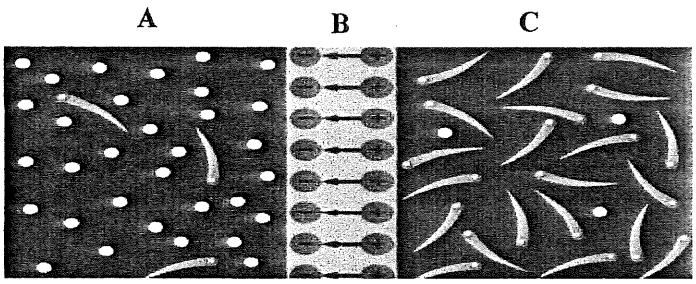


Figure 1

c) Name two (2) types of semiconductor material mainly used for developing semiconductor devices. (2 marks)

d) Sketch the PN Junction diode symbol with polarity labelled. (2 marks)

e) Using the data in Table 1:

i. Sketch the V-I characteristics curve for a forward bias diode. (3 marks)

ii. Give one (1) conclusion that can be obtained from the curve. (1 mark)

Table 1

Forward current I_F (mA)	0	0	0	0.15	0.2	0.25	0.8	2.2	4
Forward Voltage V_F (V)	0.1	0.2	0.3	0.4	0.6	0.7	0.8	1	2

f) For the series diode configuration of Figure 2, answer the following questions:

i. Name the type of biasing method applied. (1 mark)

ii. Calculate the forward voltage (V_F). (3 marks)

iii. Calculate the voltage drop at R (V_R). (3 marks)

iv. Calculate torward current (I_F). (3 marks)

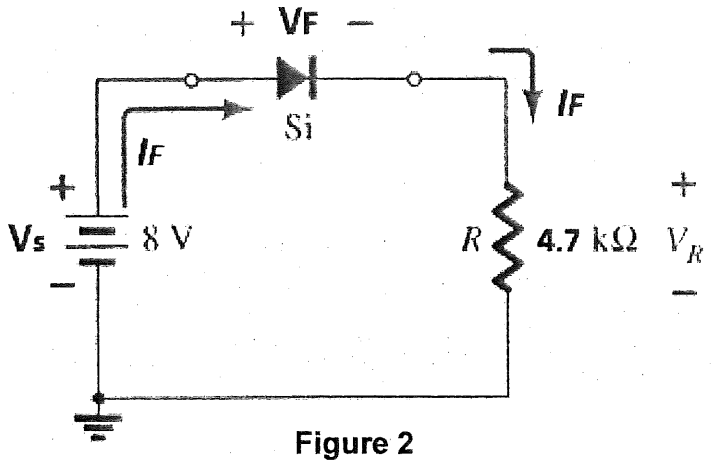


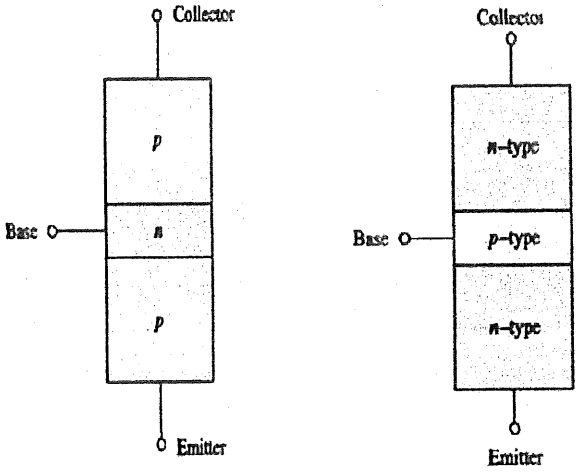
Figure 2

g) Give two (**2**) types of the diode. (2 marks)

QUESTION 2

a) Answer the following questions :

i. Refer to the physical structure of the Bipolar Junction Transistor as shown in Figure 3, name the Type A and Type B for the transistor. (4 marks)



Type A **Type B**

Figure 3

b) Refer to Figure 4 and the parameter's value stated in the circuit, calculate:

i. The Base Resistor (***RB***) if the base current (**IB**) is 4.3 mA. (4 marks)

(Hint : $V_{BB}=V_{RB}+V_{BE}$)

ii. The Collector current (***Ic***). (4 marks)

(Hint : $V_{cc} = I_cR_c + V_{CE}$)

iii. The Emitter current (***IE***). (4 marks)

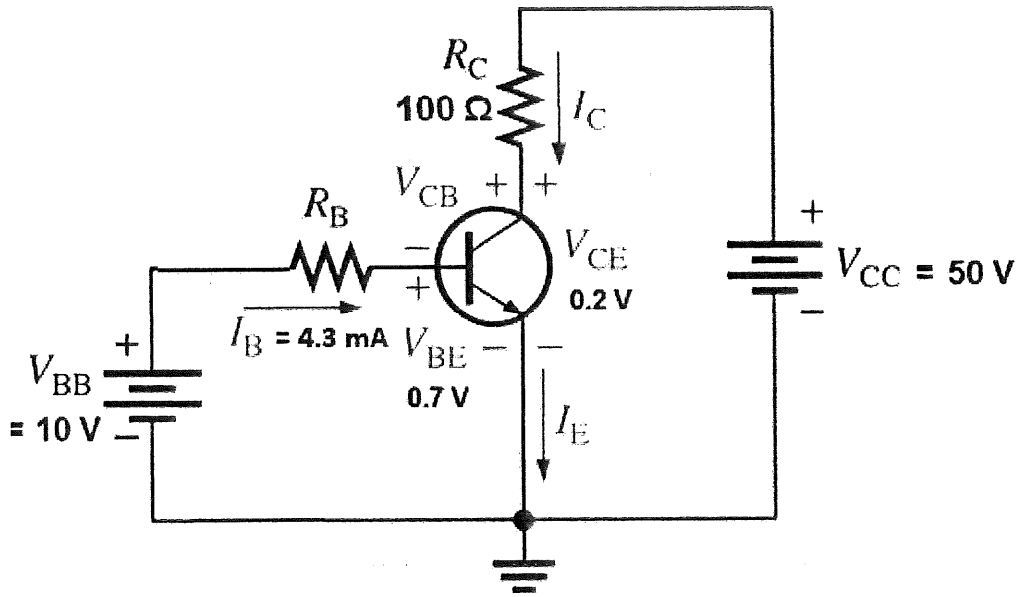


Figure 4

c) Refer to the transistor BJT V-I characteristic curve in Figure 5 : There are three (**3**) regions of operation for BJT as marked with region A, region B and region C. Name all the marked regions respectively. (3 marks)

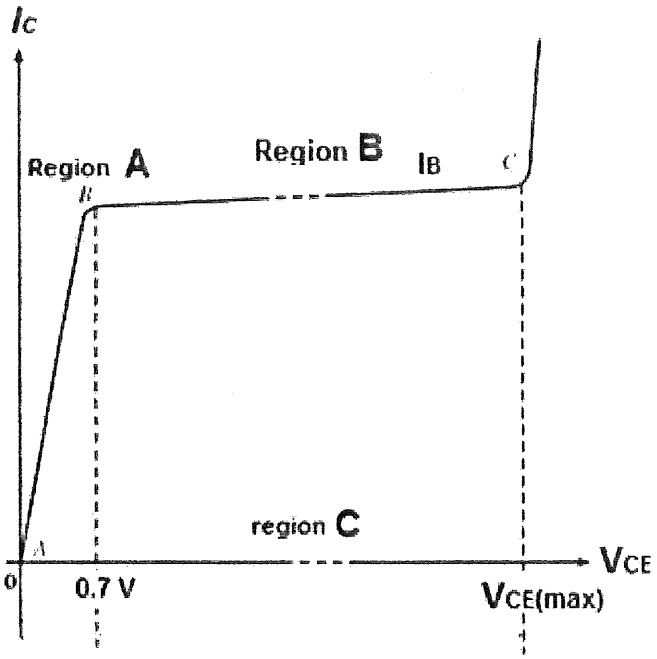


Figure 5

d) Refer to the circuit configuration in Figure 6:

i. Name the biasing method applied to the circuit. (2 marks)

ii. Compute the base voltage (V_B). (*Hint* : Apply voltage divider rule) (4 marks)

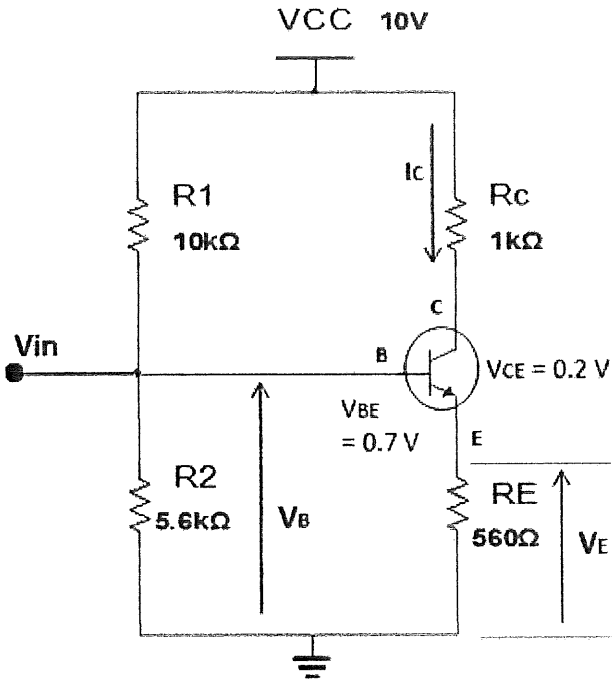


Figure 6

e) The circuit in Figure 7 shows the transistor is used to control the dc motor operation. State the function of the transistor used. (2 marks)

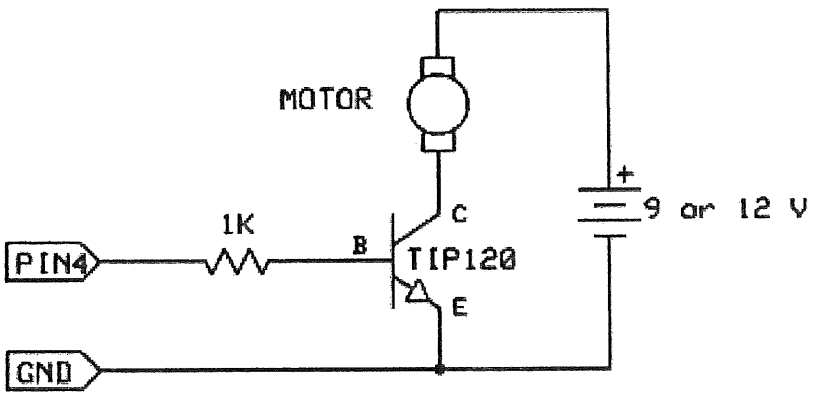


Figure 7

QUESTION 3

a) Answer the following questions by referring to the Figure 8:

i. Name the type of circuit configurations for the transistor amplifier. (2 marks)

ii. Give one (1) advantage of using this type of configuration. (1 mark)

iii. Compute the output voltage if the voltage gain (**Av**) of the system is 80.

(4 marks)

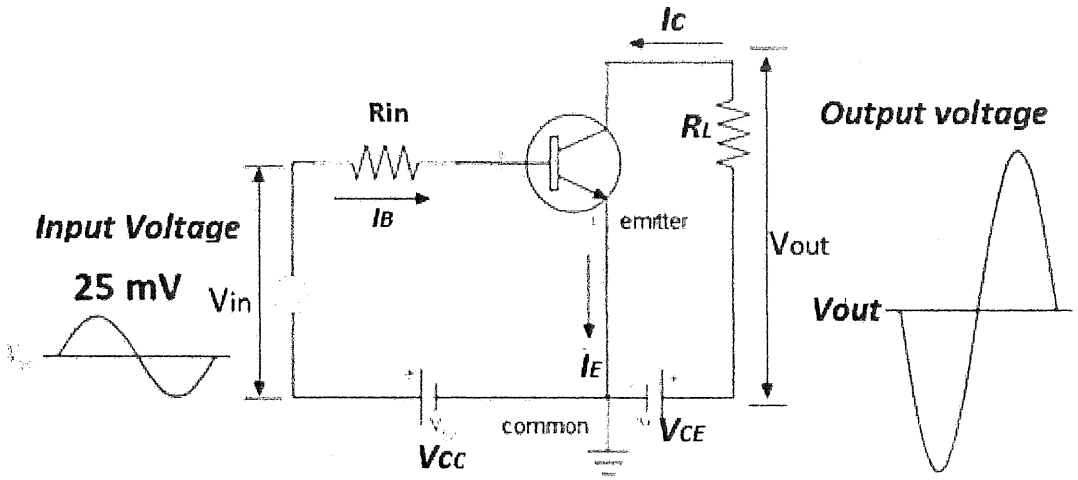


Figure 8

b) Refer to the circuit configuration of an amplifier system shown in Figure 9:

i. Calculate the biasing voltage VB. (hint: apply voltage divider rule)

(4 marks)

ii. Calculate the voltage gain (**Av**) at low frequency. (4 marks)

Given: internal resistance Re = 125 Ω

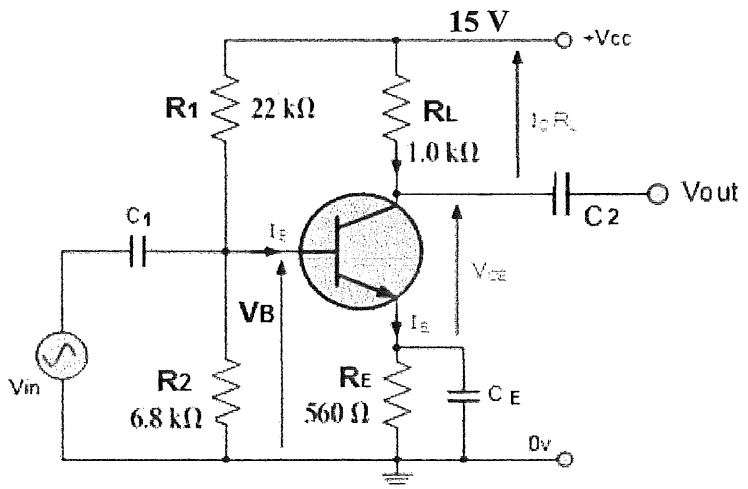


Figure 9

d) Refer to the Figure 11, answer the following questions:

i. Name the type of the transistor. (1 mark)

ii. Calculate the emitter current ***Ie1.*** (4 marks)

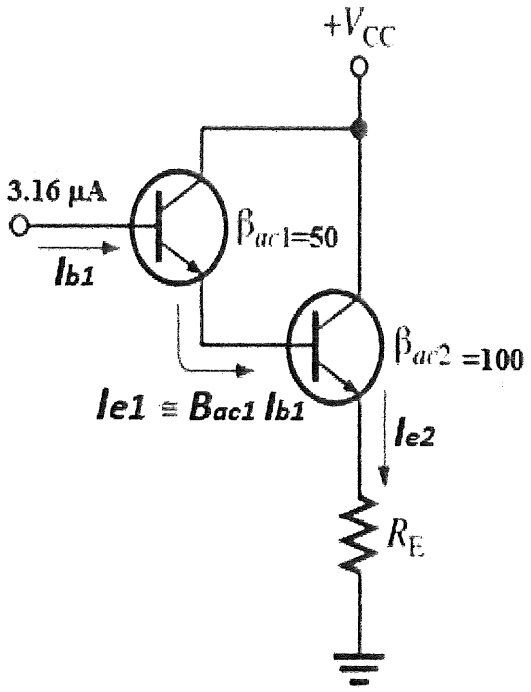


Figure 11

e circuit in Figure 14 is a circuit used to produce a class A power amplifier. is circuit is configured to produce the following data:

V_L = 15V at R_L = 150 Ω

V_{in} = 5V at Rin 0.8 kΩ.

sed on the stated data, calculate the power gain (Ap) of the system if the wer gain relationship to the input and output voltage is given by:

(5 marks)

$$Ap = \frac{P_L}{Pin}$$

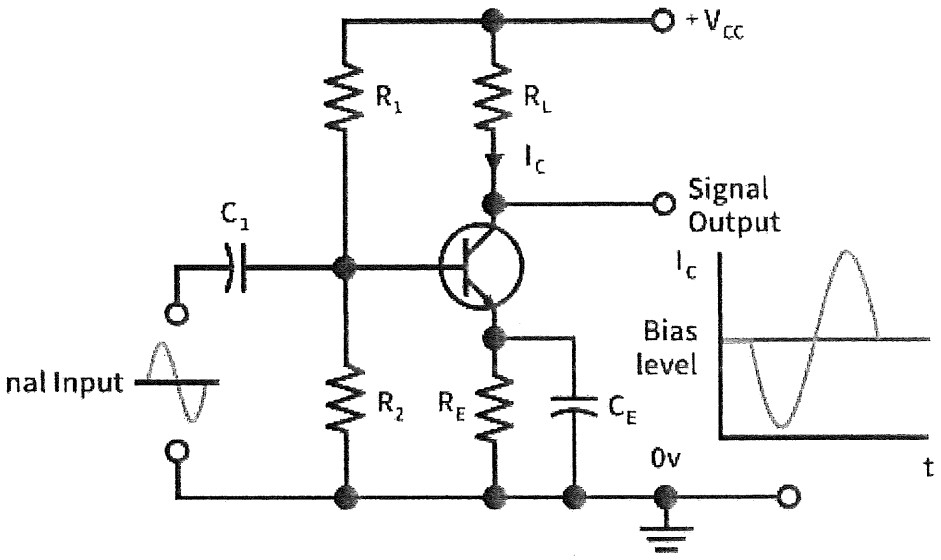


Figure 14

c) Refer to Figure 15:

i. Calculate the maximum output voltages Vout(max) when R2 is set to maximum of 5 kΩ. (3 marks)

ii. Calculate an appropriate value of R1 and R2 to produce an output voltage (Vout) is 15 V. (6 marks)

Given: $Vout = 1.25\ (1 + \frac{R2}{R1})$

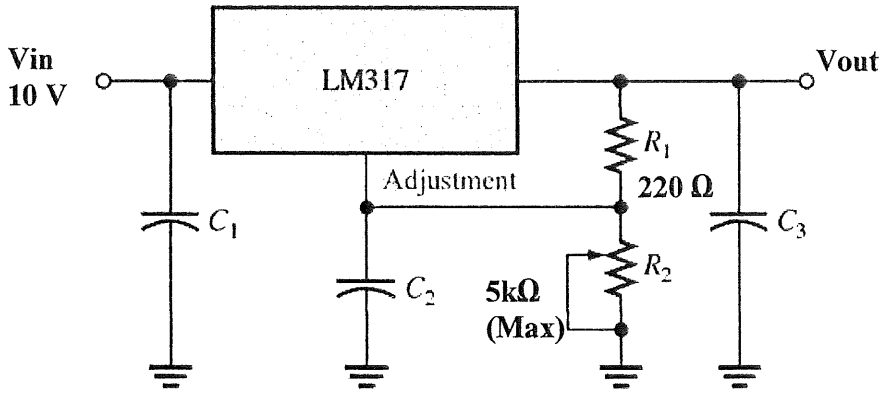


Figure 15

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