

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

COURSE CODE	: DMT 1033
COURSE	: ELECTRONICS I
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) Describe 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)

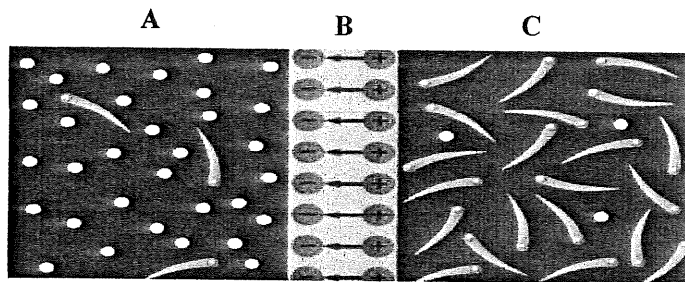


Figure 1

- 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:

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

b. Calculate:

i. Forward voltage (V_F). (3 marks)

ii. The voltage drop at R (V_R). (3 marks)

iii. Forward current (I_F). (3 marks)

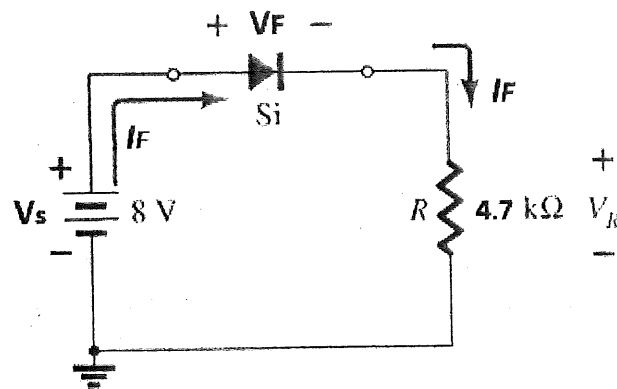


Figure 2

g) Give two (2) types of diode.

(2 marks)

QUESTION 2

a) Answer the following questions:

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

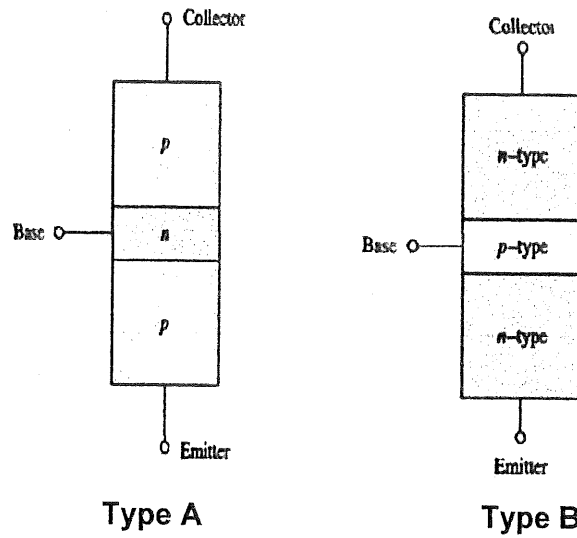


Figure 3

- ii. Refer to Figure 4 and the parameters value stated in the circuit, calculate:
- The Base Resistor (R_B) if the base current (I_B) is 4.3 mA. (4 marks)
(Hint : $V_{BB} = V_{RB} + V_{BE}$)
 - The Collector current (I_C). (4 marks)
(Hint : $V_{CC} = I_C R_C + V_{CE}$)
 - The Emitter current (I_E) (4 marks)

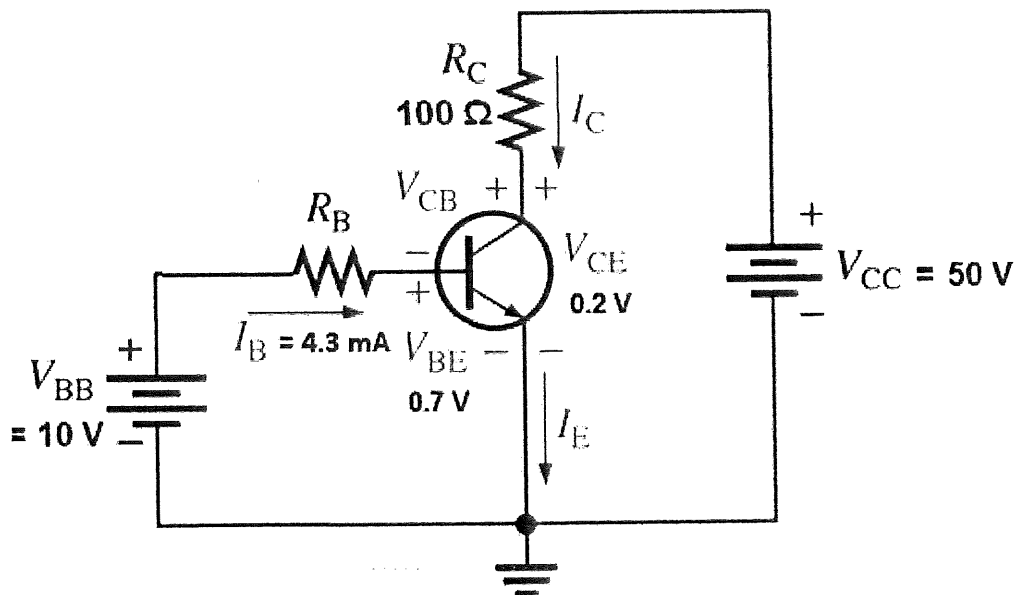


Figure 4

- b) 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)

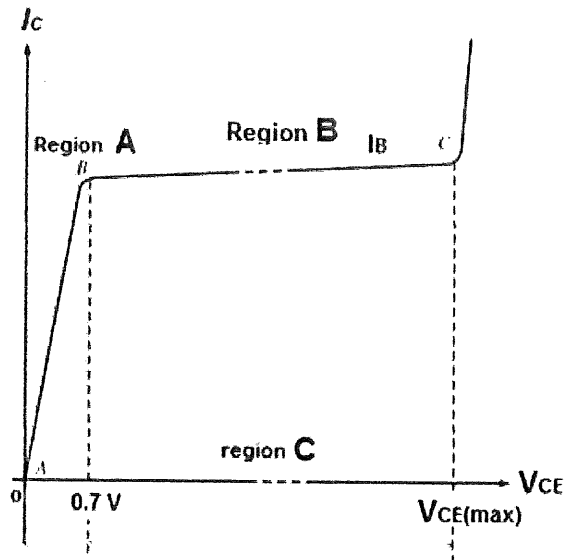


Figure 5

- c) Refer to the circuit configuration in Figure 6:
- Name the biasing method applied to the circuit. (2 marks)
 - Compute the base voltage (V_B). (Hint : Apply voltage divider rule) (4 marks)

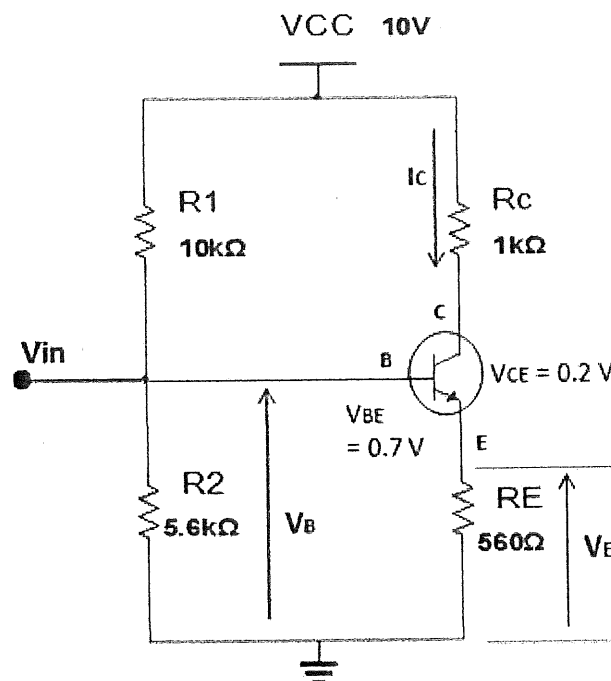


Figure 6

- d) 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)

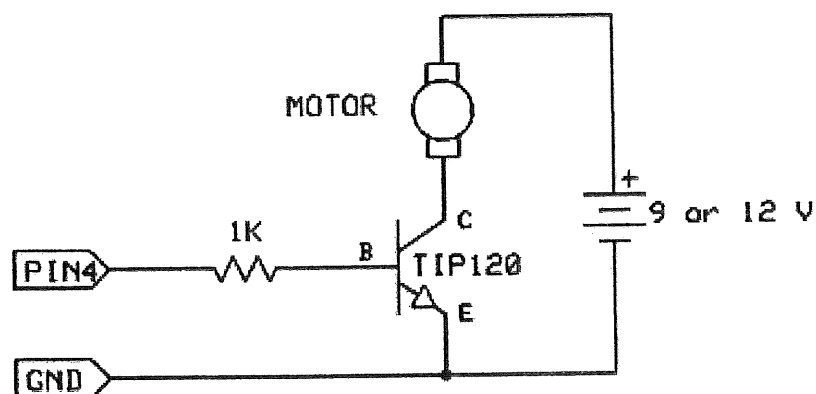


Figure 7

QUESTION 3

- a) Answer the following questions by referring to the Figure 8 :
- Name the type of circuit configurations for the transistor amplifier. (2 marks)
 - Give one (1) advantage of using this type of configuration. (1 mark)
 - Compute the output voltage if the voltage gain (A_v) of the system is 80.

(4 marks)

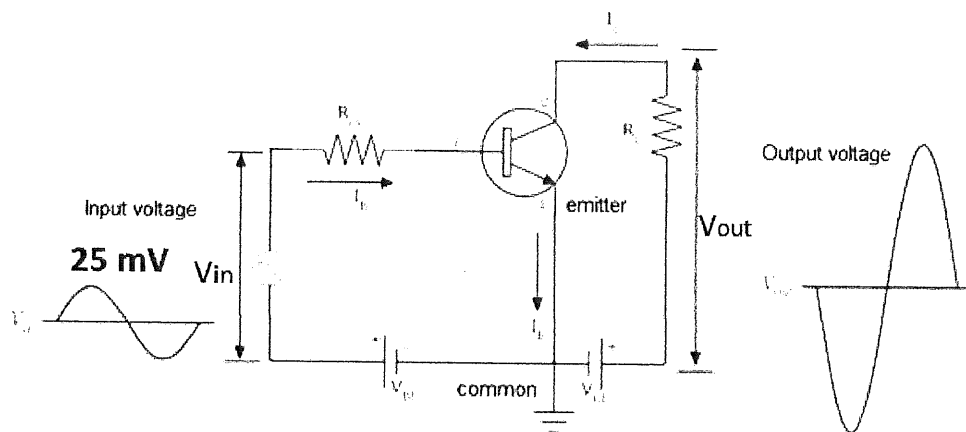


Figure 8

- b) Refer to the circuit configuration of an amplifier system shown in Figure 9:
- Calculate the biasing voltage V_B . (hint: apply voltage divider rule) (4 marks)
 - Calculate the voltage gain (A_v) at low frequency. (4 marks)
- Given: internal resistance $R_e = 125 \Omega$

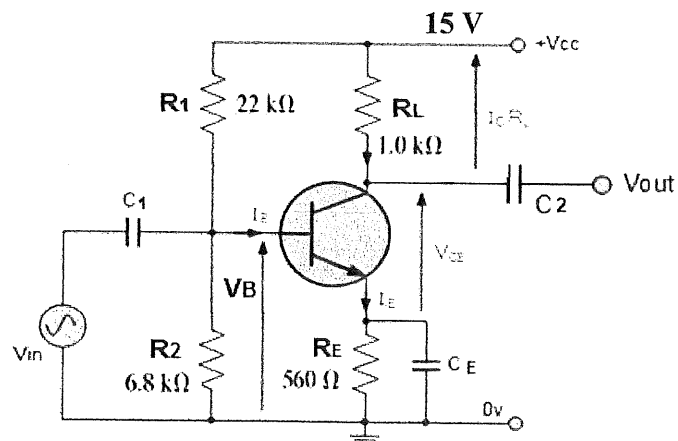


Figure 9

c) Refer to the Output Characteristics Curves of an amplifier system shown in Figure 10 :

- i. Determine the minimum base current $I_{B(\min)}$ and maximum base current $I_{B(\max)}$. (4 marks)
- ii. Compute the Collector-Emitter peak to peak voltage V_{CE} (peak-peak). (4 marks)

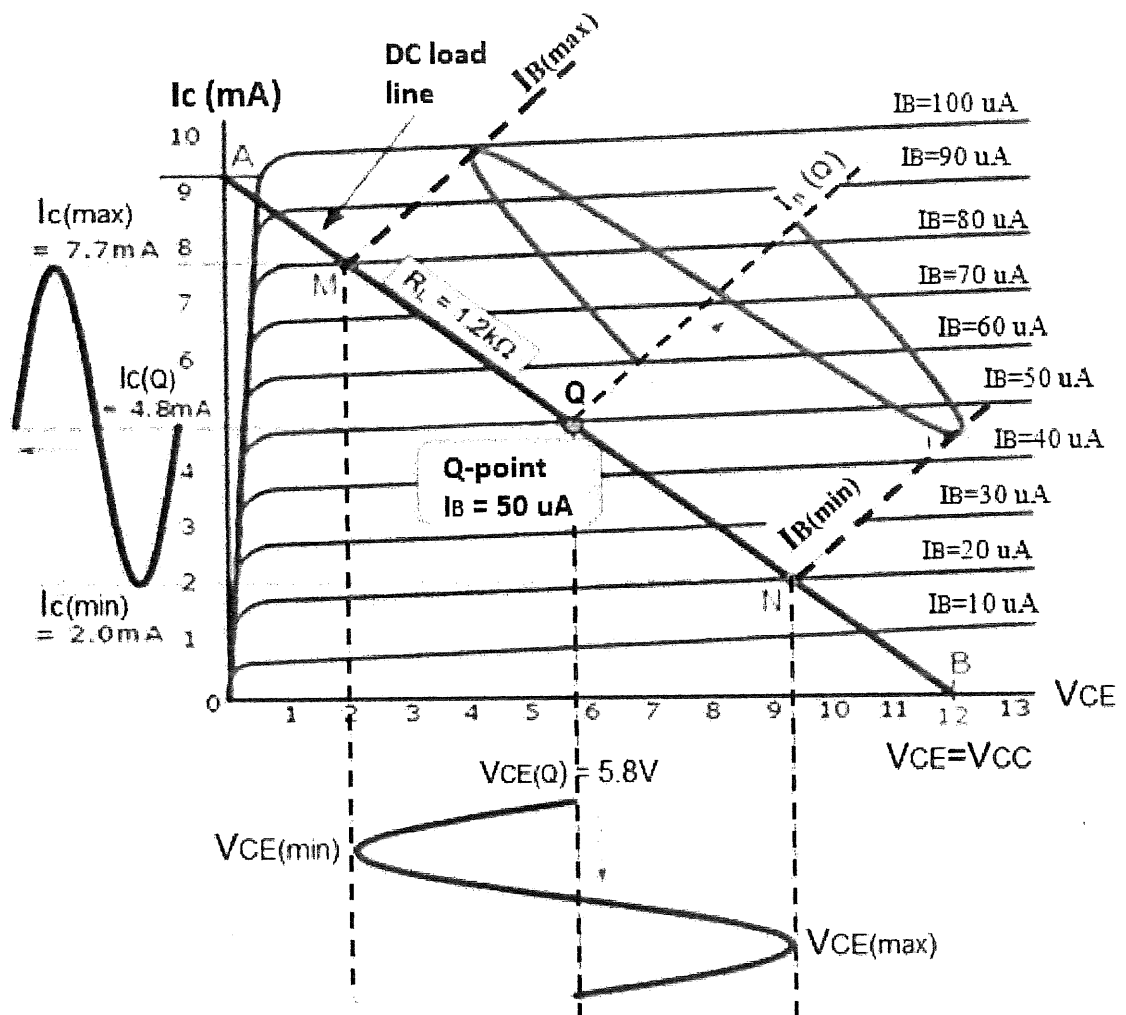


Figure 10

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

- Name the type of the transistor. (1 mark)
- Calculate the emitter current I_{E1} . (4 marks)

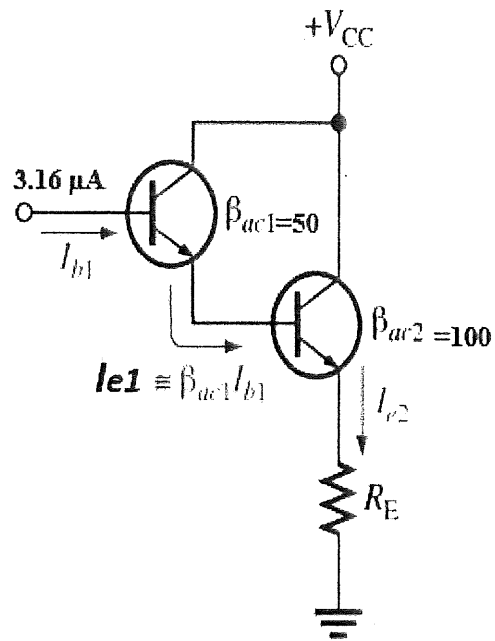


Figure 11

QUESTION 4

- a) Figure 12 and 13 are the characteristics of the input and output signals for a certain class of power amplifier:

- i. Name the class of the power amplifier system. (2 marks)

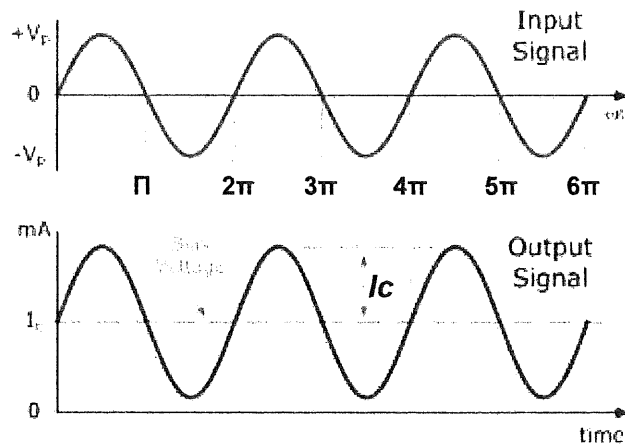


Figure 12

- ii. Name the class of the power amplifier system. (2 marks)

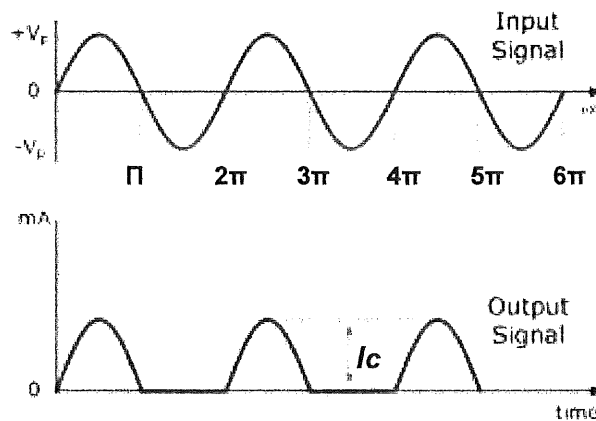


Figure 13

- b) The circuit in Figure 14 is a circuit used to produce a class A power amplifier. This circuit is configured to produce the following data :

$$V_L = 15V \text{ at } R_L = 150 \Omega$$

$$V_{in} = 5V \text{ at } R_{in} 0.8 \text{ k}\Omega.$$

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

(5 marks)

$$A_p = \frac{P_L}{P_{in}}$$

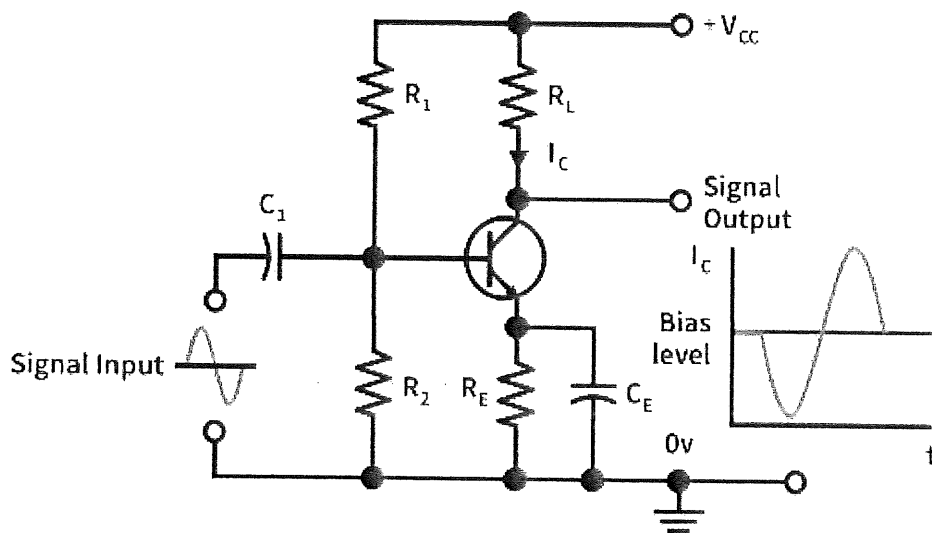


Figure 14

c) Refer to Figure 15:

- Calculate the maximum output voltages $V_{out(max)}$ when R_2 is set to the maximum of $5\text{ k}\Omega$. (3 marks)
- Calculate an appropriate value of R_1 and R_2 to produce output voltage (V_{out}) is 15 V . (6 marks)

$$\text{Given: } V_{out} = 1.25 \left(1 + \frac{R_2}{R_1}\right)$$

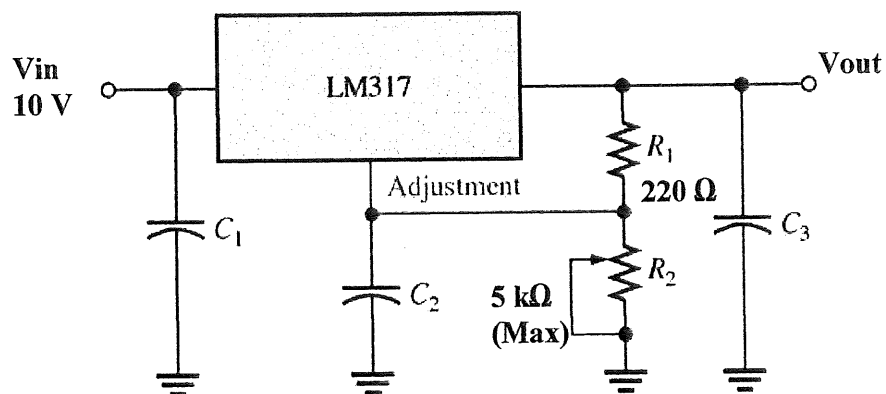


Figure 15

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

