



(Knowledge for Development)

**KIBABII UNIVERSITY
UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR**

**END OF SEMESTER EXAMINATIONS
YEAR ONE SEMESTER ONE EXAMINATIONS
(JAN INTAKE)**

**FOR THE DEGREE OF
BACHELOR OF SCIENCE
(COMPUTER SCIENCE)**

COURSE CODE: CSC 113

COURSE TITLE: ELECTRONICS

DATE: FRIDAY 14TH, MAY 2021 TIME: 8.00 A.M – 10.00 A.M

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS

QUESTION ONE [COMPULSORY] [20 MARKS]

- (a) Resistivity of a semiconductor changes with the rise in temperature. Explain [3 marks]
- b) Differentiate between Valence and Conduction bands [4 marks]
- (i) Figure 1 shows a setup for half-wave rectification. Briefly explain how it works. [4 marks]

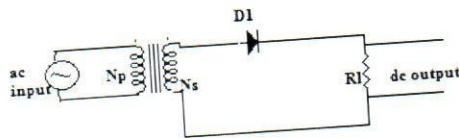


Figure 1

- (ii) Draw the typical shape of output waveform if the input signal is a sine wave. [3 marks]
- (iii) Sketch the forward and reverse characteristics of the diode. [4 marks]
- c) Differentiate between the following terms [2 marks]
- i) intrinsic and extrinsic semiconductors [2 marks]
 - ii) N-type and P-type semiconductors
- d) Using the graph of figure 2, determine the dc resistance levels for the diode at [2 marks]
- i) $I_D = 2 \text{ mA}$ [2 marks]
 - ii) $I_D = 20 \text{ mA}$ [4 marks]
 - iii) $V_D = -10 \text{ V}$

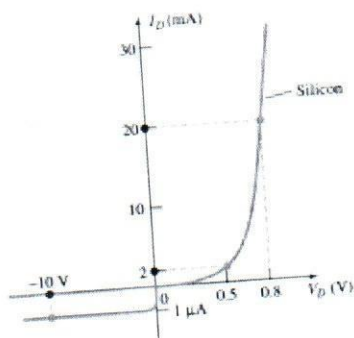


Figure 2

QUESTION TWO [20 MARKS]

(a) For the series diode configuration of Fig. 3, determine V_D , V_R , and I_D .

[4 marks]

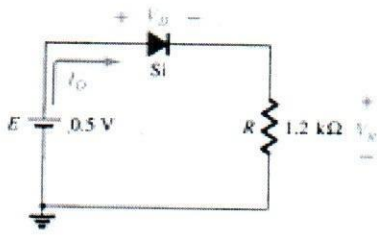


Figure 3

(b) Determine V_O , I_1 , I_{D1} , and I_{D2} for the parallel diode configuration of Fig. 4

[6marks]

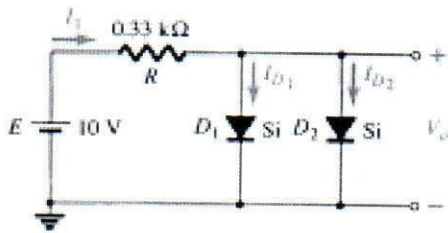


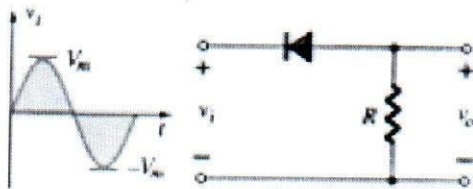
Figure 4

(c) Differentiate between a diode clipper and a diode clamper.

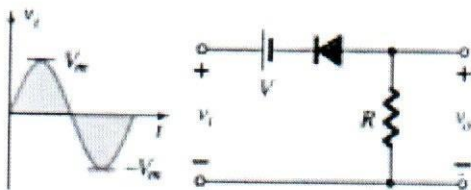
[2 marks]

(d) For the clippers networks using ideal diodes, draw the resulting output waveforms [8 marks]

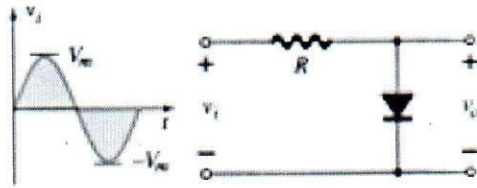
i)



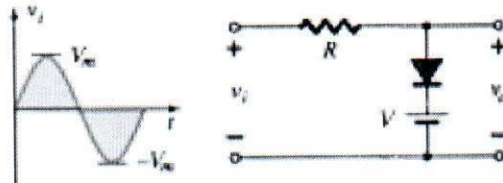
ii)



iii)



iv)

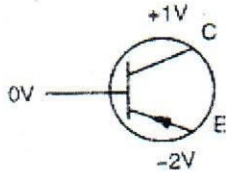


QUESTION THREE [20 MARKS]

- In a BJT transistor a change of 7.89mA in the emitter current produces a change of 7.8 mA in the collector current. What change in the base current is necessary to produce an equivalent change in the collector current, assuming silicon transistor is used? [4 marks]
- Assuming that a PN junction has just been formed, briefly explain using diagrams what happens. [4 marks]
- Using diagrams differentiate between the conduction and valence bands of conductors, insulators and semiconductors. [6 marks]
- The ratio of the number of free electrons to holes n_e/n_h for two different materials A and B are 1 and <1 respectively. Name the type of semiconductor to which A and B belongs. [2 marks]
- Differentiate between Zener effect and avalanche effect [4 marks]

QUESTION FOUR [20 MARKS]

- a) Identify which junction is forward or reverse biased in the figure below. Explain whether the transistor in that biasing state can be used as an amplifier. [3 marks]



- b) How are the collector and base currents affected if the emitter and base of n-p-n transistor have same doping concentrations. [3 marks]
- c) i) For the Zener shunt regulator of figure 4, determine V_L , V_R , I_Z , and P_Z
- ii) Repeat part (i) with $R_L = 3 \text{ k}\Omega$ [14 marks]

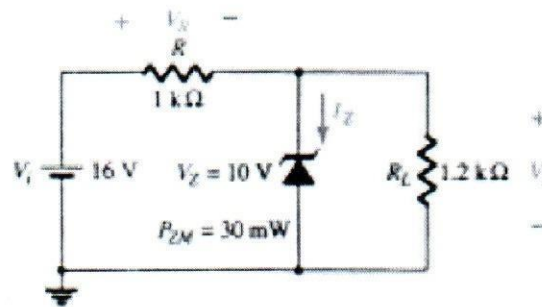


Figure 4

QUESTION FIVE [20MARKS]

- a) Using the characteristics of Fig. 5, determine
- i) The resulting collector current if $I_E = 3 \text{ mA}$ and $V_{CB} = 10 \text{ V}$. [2 marks]
- ii) The resulting collector current if I_E remains at 3 mA but V_{CB} is reduced to 2 V . [2 marks]

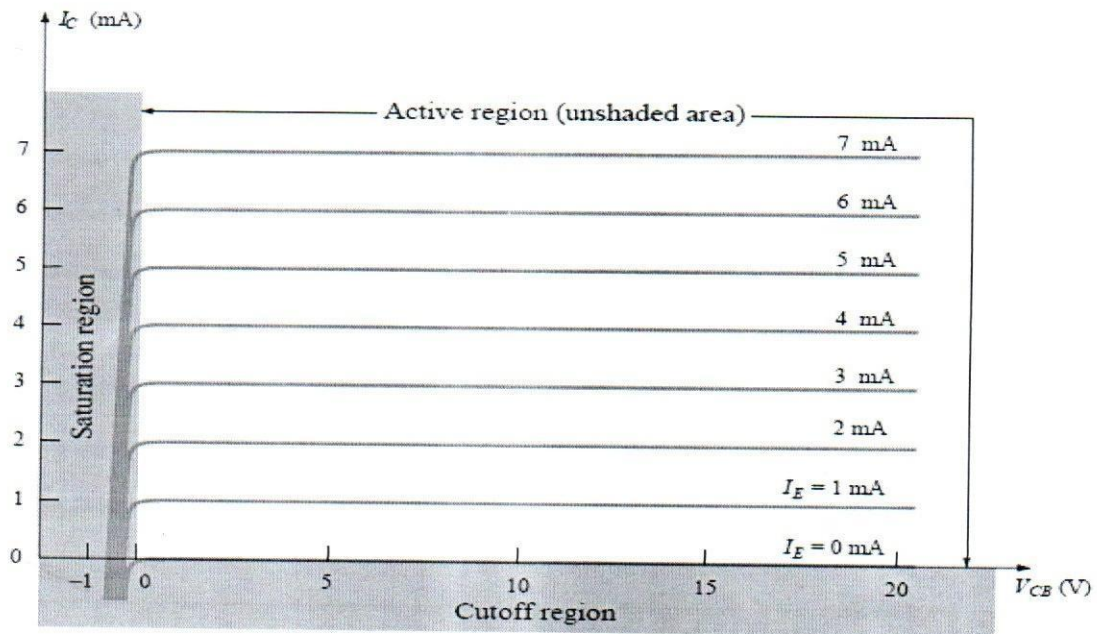


Figure 5

b) Determine the following for the fixed-bias configuration of Fig. 6.

i) I_{BQ} and I_{CQ} .

[4 marks]

ii) V_{CEQ} .

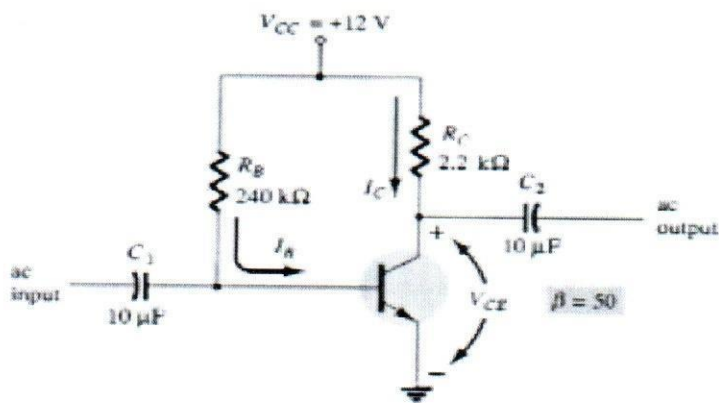
[2 marks]

iii) V_B and V_C .

[2 marks]

iv) V_{BC} .

[2 marks]



(ii) Explain the biasing states of a transistor junctions during cut off, active and saturation conditions. In which of these states does the transistor operate in when being used as a switch?

[6 marks]