(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2019/2020 ACADEMIC YEAR

SPECIAL/SUPPLEMENTARY EXAMINATION

YEAR ONE SEMESTER ONE EXAMINATIONS

FOR THE BACHELORS DEGREE

COMPUTER SCIENCE

COURSE CODE: CSC 113

COURSE TITLE: ELECTRONICS

DATE: 12/02/2021 **TIME: 11.00 A.M – 01.00 P.M**

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE AND ANY OTHER TWO (2) QUESTIONS

QUESTION ONE [COMPUSORY] [30 MARKS]

a) Differentiate between

i) intrinsic and extrinsic semiconductors (2 marks)

ii) p-type and n-type semiconductors (2 marks)

iii) donor and acceptor atoms (2 marks)

b) With the aid of a labeled diagram explain the conduction of current in a good conductor. Why does a conductor have low resistance? (4 marks)

c) Explain the following terms;

(i) Positive feedback.

(ii) Negative feedback. (2marks)

d) With the aid of diagrams, illustrate four types of feedback. (2marks)

e) Give a brief explanation on how a bipolar junction transistor amplifies current. (2 marks)

f) What is the difference in the output when a single phase half-rectifier is replaced by a full-wave rectifier? (4 marks)

g) Draw the schematic of a pn-junction diode in

(i) Forward-biased mode. (3 marks)

(ii) reverse-biased mode (3 marks)

Show in each case the polarity of voltage source (positive and negative terminal of the source) and the current direction.

h) Determine the range of V for obtaining a regulated voltage shown in Fig.1(c) for the data

$0 \le I_L \le 4mA$

$2 \le I_Z \le 8mA$ (4 Marks)

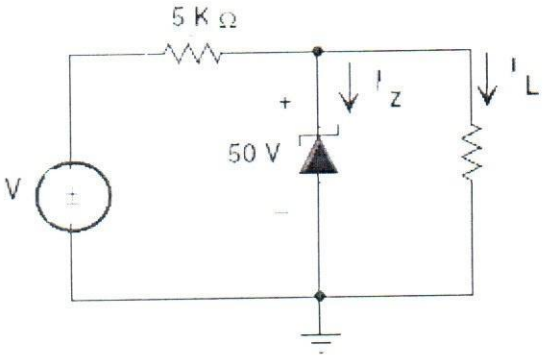


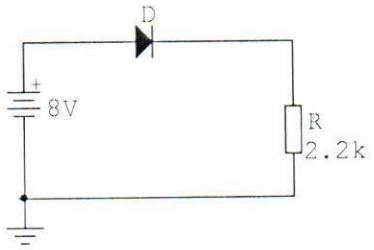
Figure 1(c)

QUESTION TWO [20 MARKS]

a) Explain the main difference between rectifier diode, light emitting diode and Zener diode.(3 marks)

b) Describe Zener diode and briefly explain how it regulates the voltage? What happens to the series current, load current and Zener current when the d.c. input voltage of a Zener regulator increases? (7marks)

c) (i) For the series circuit shown determine V_D, V_R, and I_D. (3 marks)



d) Derive the relation : $\alpha_{dc} = \dfrac{\beta_{dc}}{1+\beta_{dc}}$ (4 marks)

QUESTION THREE [20 MARKS]

a) Explain the term "doping" and briefly explain why it is done in semiconductors(3 marks)

b) A load line intersects the forward V-I characteristic of a silicon diode at Q, where the slope of the curve is 40mA/V. Calculate the diode resistance at the point Q. (4marks)

c) For the circuit shown in figure 3(a), draw the waveform of output voltage Vo. Assume ideal diode D and lossless capacitor C. (6 marks)

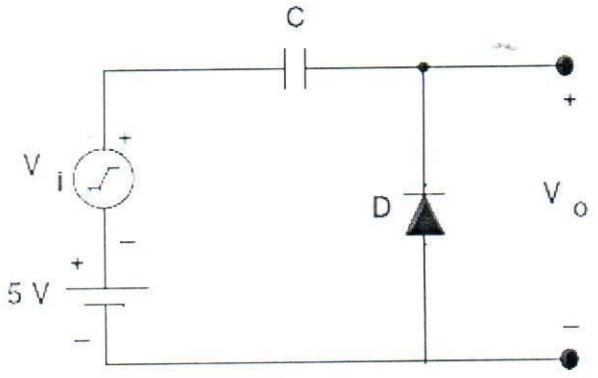


Figure 3(a)

d) Describe the phenomenon of avalanche and zener breakdown. (4 marks)

e) Explain physically how a p-n junction functions as a rectifier. (3 marks)

QUESTION FOUR [20 MARKS]

a) Explain why a semiconductor behaves like an insulator at absolute zero temperature.(2marks)

b) Explain what happens to the conductivity of semiconductor with respect with rise in temperature. Compare with conductivity of metals. (3 marks)

c) Explain the effect of temperature on extrinsic semiconductors (2 marks)

d) Explain the effect of negative feedback on the following in amplifier;

(i) Stability of amplifier again
(ii) Bandwidth (6 marks)

e) Explain briefly how n- type and p- type materials are formed. (4 marks)

f) Compare CB and CE transistor configurations with regard to AC input and output resistance. (3marks)

QUESTION FIVE [20 MARKS]

a) What is the importance of a valence shell and valence electrons? (3 marks)

b) (i) Using transistor current relationship, derive the relationship between α, γ and β(4 marks)

(ii) Briefly describe three modes of connection of a transistor in a circuit. (3 marks)

(iii) Explain how a transistor is biased for amplification. (2 marks)

c) For the Zener shunt regulator of figure 4(b), determine the load current, minimum and maximum Zener current. (8 marks)

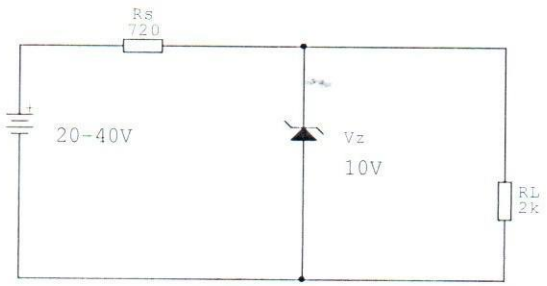


Figure 4b