BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF SCIENCES AND ENGINEERING

JUN 2025

DEPARTMENT OF ENGINEERING AND PHYSICS

ELECTRONIC ENGINEERING DEVICES AND CIRCUITS ANALYSIS

EEE1203

Examination Paper

Time Allowed: 3 hours

Total Marks: 100

Special Requirements: Calculator, Graph Paper

Examiner's Name: S. Komichi

INSTRUCTIONS

1. Answer any FOUR questions only.
2. Each question carries 25 marks.
3. Show your steps clearly in any calculation.
4. Start the answers for each question on a fresh page.

MARK ALLOCATION

QUESTION	MARKS
1.	25
2.	25
3.	25
4.	25
5.	25
6.	25
7.	25
TOTAL	100

Question 1

Determine the dc resistance levels for the diode of Figure 1.1 below at

(a) I_D = 2 mA

(b) I_D= 20 mA

(c) V_D=10 V [4], [4], [4]

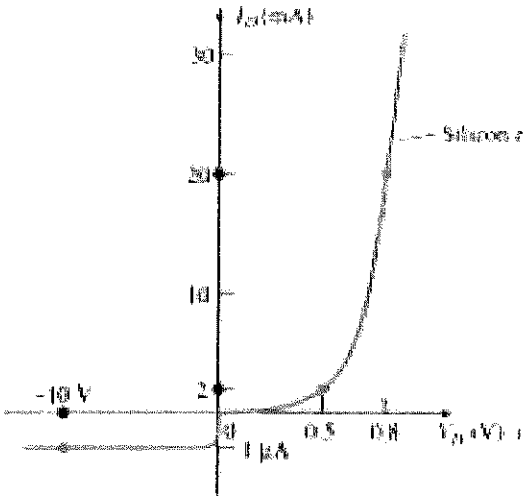

Figure 1.1 Diode Characteristics

(d) (i) Design the voltage divider of Figure 1.2 below such that $V_{R1} = 4V_{R2}$

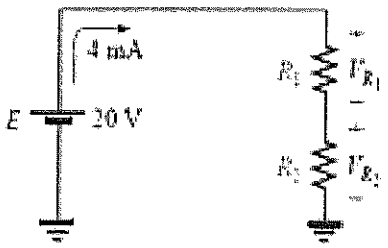

Figure 1.2: Voltage Divider [5]

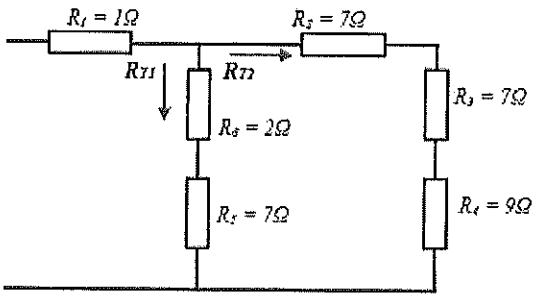

Figure 1.3: Resistor Network

(d) (ii) Calculate total resistances for circuit in Figure 1.3 above; also calculate branch resistances for the circuit. [2], [3], [3]

Question 2

a) For the series diode configuration of Figure 2.1 employing the diode characteristics of Figure 2.2 determine:
(i) V_{DQ} and I_{DQ}.
(II) V_R. [3], [3], [4].

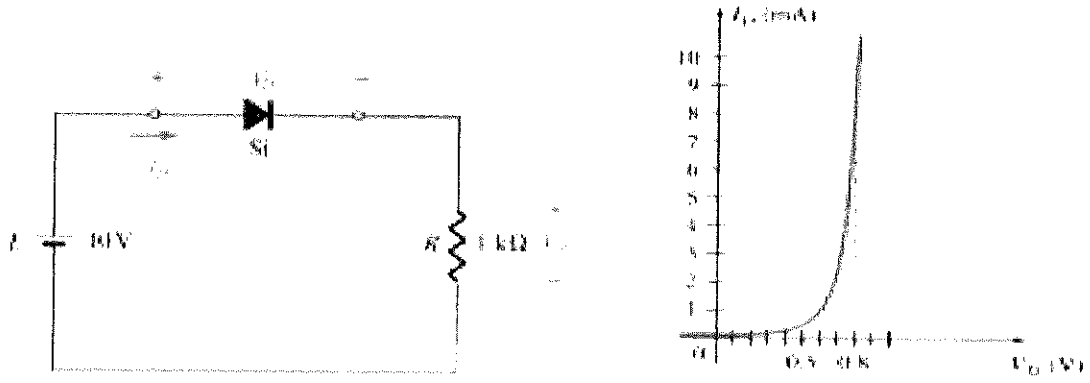

Figure 2.1: Series Diode and Characteristics

b) Determine Vo and I_D for the series circuit of Figure 2.2 below.

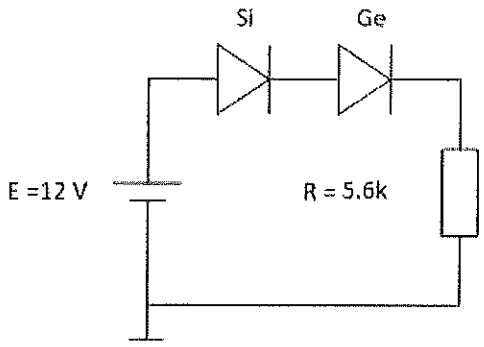

Figure 2.2: Diodes Network [3], [3]

c) For the circuit below Figure 1.4 determine V_2, Current I, resistors R_1 and R_3 using KVL.

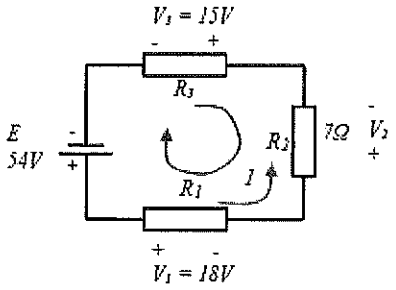

Figure 2.3: Resistor Network [4], [4]

Question 3

a) The emf of a battery is 22.5V. How much charge flows if energy transferred is 90J? What is the current it the transfer time is 1.5 minutes? [6]

b) Determine the resistance of a 30m copper wire with a diameter of 0.032cm and resistivity of 1.723 x 10-8. [6]

c) What is the pd across a lamp that dissipates 1000J in 10 seconds if current is 0.4A? [6]

d) Draw the common collector transistor configuration circuit clearly showing the current directions. [7]

Question 4

a) Find the indicated currents and voltages for the network of Figure 4.1 below. Also find current in each branch (I_1, I_2, I_3, I_4 and I_5) that is current through each resistor as well as V_1 and V_5. [3], [3], [3], [3], [3]

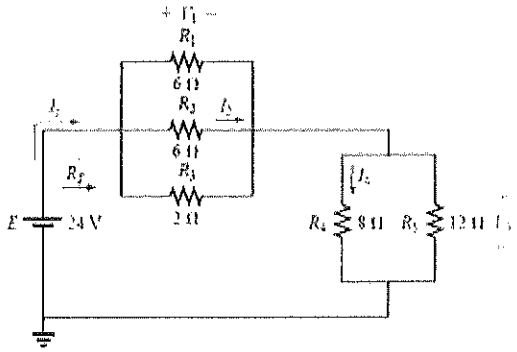

Figure 4.1: Resistor Networks

b) Determine the voltage Vo for the network of Figure 4.2 below. [5]

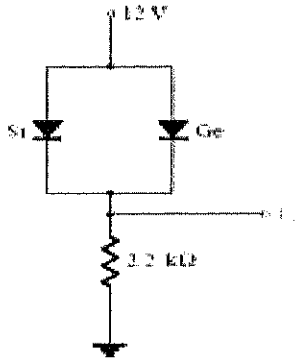

Figure 4.2: Diode Network

Calculate the total current through the 4kΩ resistor and the currents through the Si and the Ge diodes for the circuit in Figure 1.6. [2], [2], [1]

Question 5

a) Given the load line of Figure 5.1 and the defined Q-point, determine the required values of V_{CC}, R_C, and R_B for a fixed-bias configuration. [4], [4], [5]

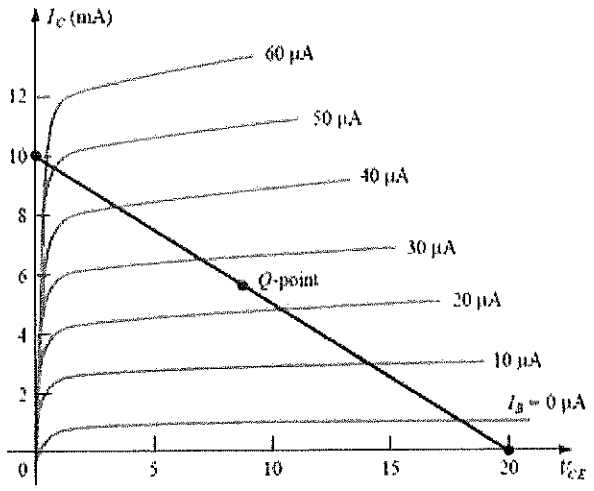

Figure 5.1: Load Line Analysis

b) For the emitter bias network of Figure 5.2 below, determine:

(i) I_B.
(ii) I_C.
(iii) V_{CE}.
(iv) V_C.
(v) V_E.
(vi) V_B. [2], [2], [2], [2], [2], [2]

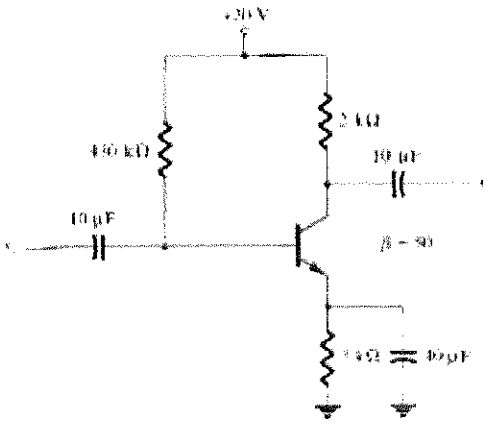

Figure 5.2: Emitter Stabilized Circuit

Question 6

a)

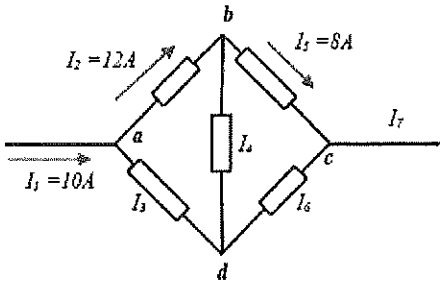

Figure 6.1: Resistor Network

a) Find the magnitude and direction of the currents in Figure 6.1 I_3, I_4, I_6 and I_7 above. [8]

b) Give two differences between the Rectifier diodes and Zener diodes. [4]

c) (i) For the network of Figure 6.2 below, determine the range of R_L and I_L that will result in V_{RL} being maintained at 10 V.

(ii) Determine the maximum and minimum wattage rating of the diode in Figure 6.2 below. [3], [3], [3], [4]

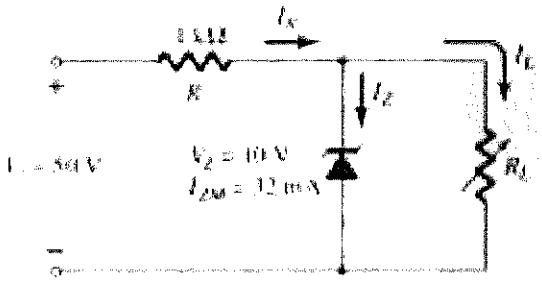

Figure 6.2: Zener Regulator

Question 7

a) Determine the quiescent levels of I_{CQ} and V_{CEQ} for the network of Figure 7.1 below [13]

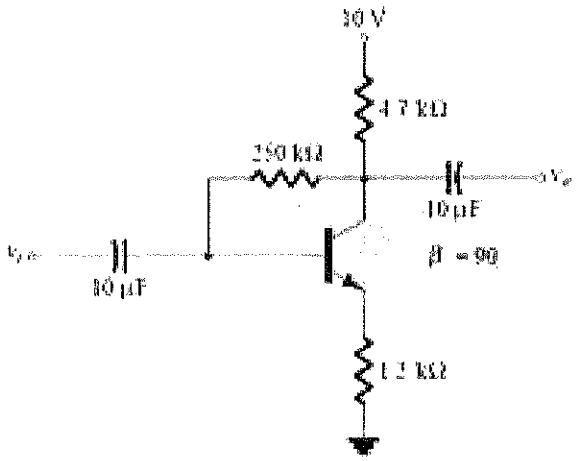

Figure 7.1: Bias Network

Question 7

b) Determine the dc bias voltage V_{CE} and the current I_C for the voltage-divider configuration of Figure 7.2 below. [12]

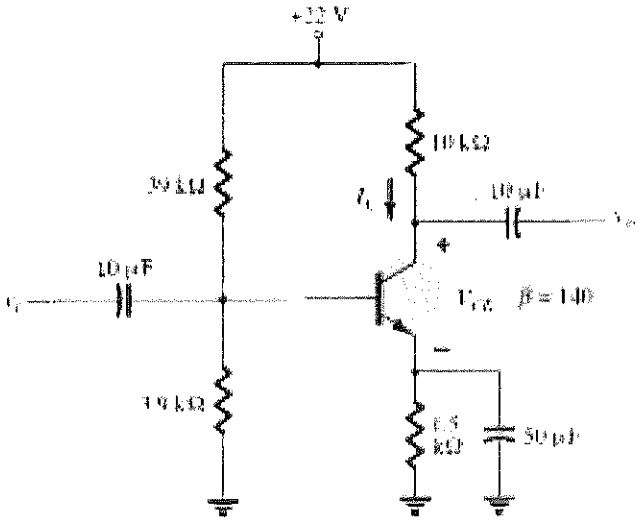

Figure 7.2: Voltage Divider Circuit