BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF ENGINEERING AND SCIENCES

DEPARTMENT OF ENGINEERING AND PHYSICS

ELECTRONIC ENGINEERING CIRCUITS

EEE 1203

Examination Paper [3]

This examination paper consists of 8 pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements: Calculator, Graph Paper

Examiner's Name: S. Komichi

INSTRUCTIONS

1. Answer any FIVE questions only.
2. Each question carries 20 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.	20
2.	20
3.	20
4.	20
5.	20
6.	20
7.	20
TOTAL	100

Question 1

For the characteristics of Figure. 1.1 below;

(a) Determine the ac resistance at I_D= 2 mA.

(b) Determine the ac resistance at I_D=25 mA.

(c) Compare the results of parts (a) and (b) to the dc resistances at each current level.

[3], [3], [3]

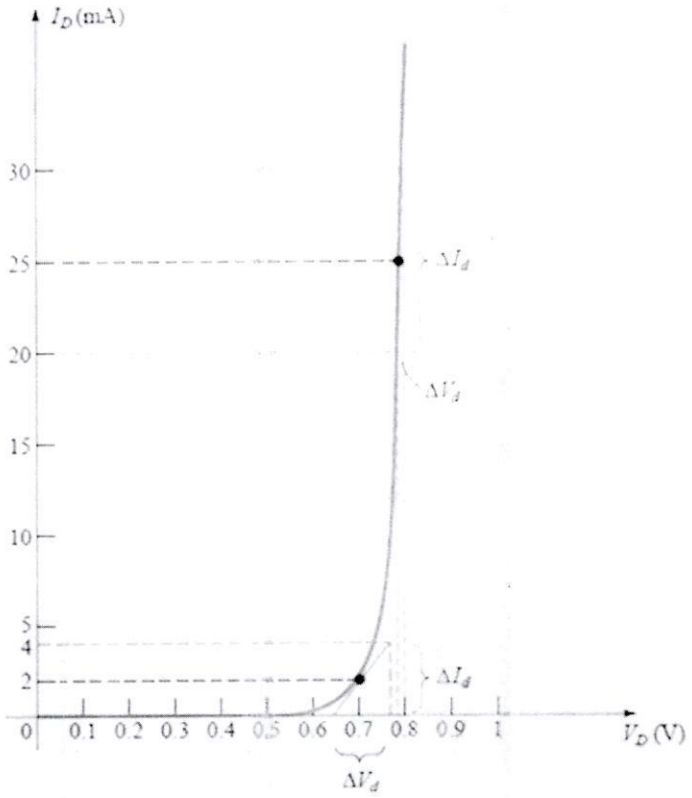

Figure 1.1 Diode Characteristics

(d) (i) Determine I_D, V_{D2}, and Vo for the circuit of Figure 1.2 below;

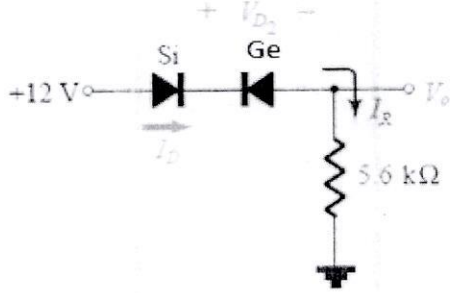

Figure 1.2: Diode Circuit [7]

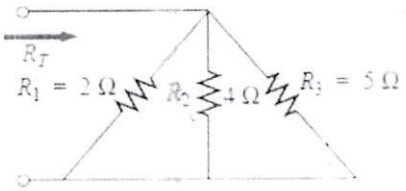

Figure 1.3: Resistor Network

(d) (ii) Determine the total resistance for the network of Figure 1.3 above. [4]

Question 2

a) For the series diode reverse configuration of Figure 2.1, determine V_D, V_R, and I_D. [2], [2], [4].

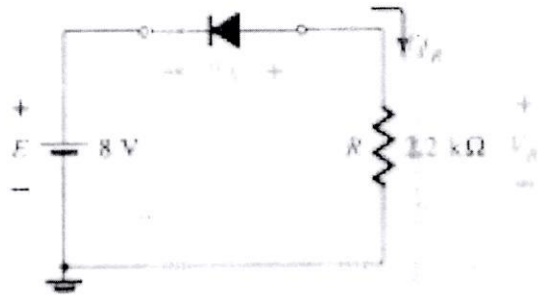

Figure 2.1: Series Diode

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

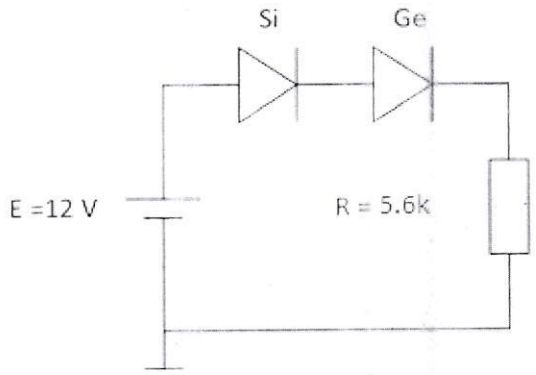

Figure 2.2: Diodes Network [3], [3]

c) (i) Find the voltages V_1, V_3, and V_{ab} for the network of Figure 2.3 below.

(ii) Calculate the source current I_s.

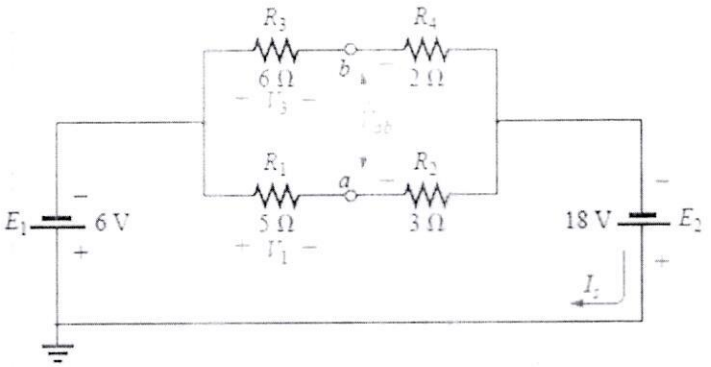

Figure 2.3: Resistor Network [3], [3]

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? [5]

b) Determine the resistance of a 30m copper wire with a diameter of 0.032cm and resistivity of 1.723 x 10-8. [5]

c) What is the pd across a lamp that dissipates 1000J in 10 seconds if current is 0.4A? [5]

d) Draw the common collector transistor configuration circuit clearly showing the current directions. [5]

Question 4

a) Calculate the indicated currents (I_5, I_s, I_6) and voltages (V_5 *across* R_5, V_7 *across*) of Figure 4.1 below. [2], [2], [2], [2], [2]

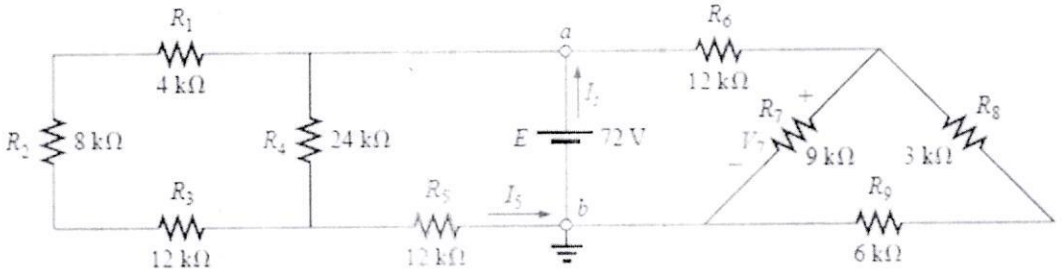

Figure 4.1: Resistor Networks

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

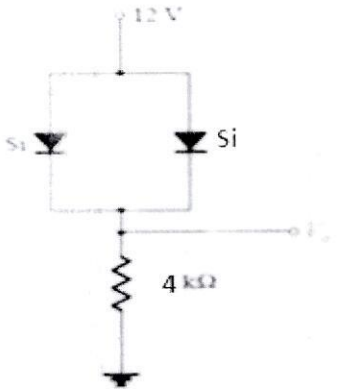

Figure 4.2: Diode Network

c) Draw the common emitter transistor configuration circuit clearly showing the current directions. [5]

Question 5

a) Determine I_s, I_{R2}, I_{R3}, I_{R4}, I_{R5}, I_{R6} and R_T for the circuit in Figure 5.1 below;

[2], [2], [1], [1], [1], [1], [2]

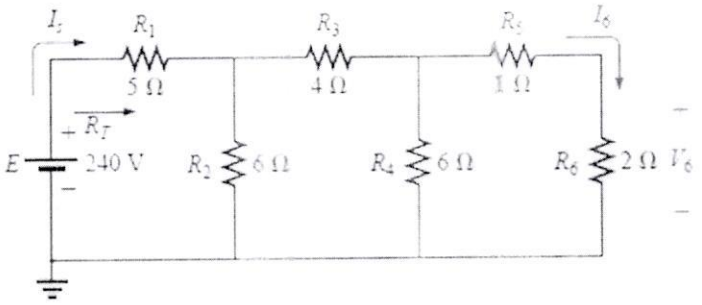

Figure 5.1: Resistor Network

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], [1], [2], [2], [2], [1]

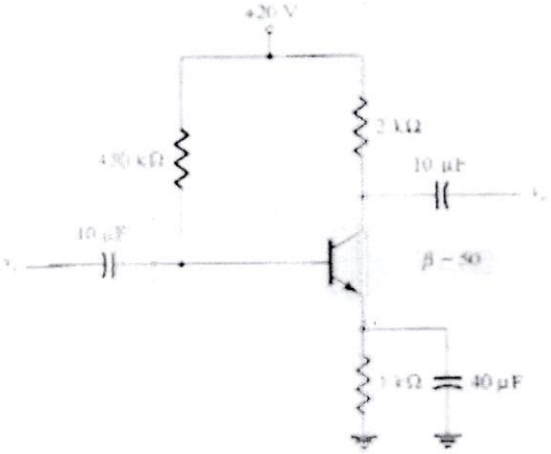

Figure 5.2: Emitter Stabilized Circuit

Question 6

a) Determine the currents I_1, I_2, and I_{D2} for the network of Figure 6.1 below.

[3], [3], [3]

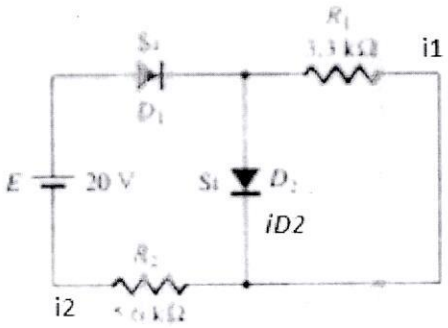

Figure 6.1: Resistor-Diode Network

b) (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. [4], [4], [3]

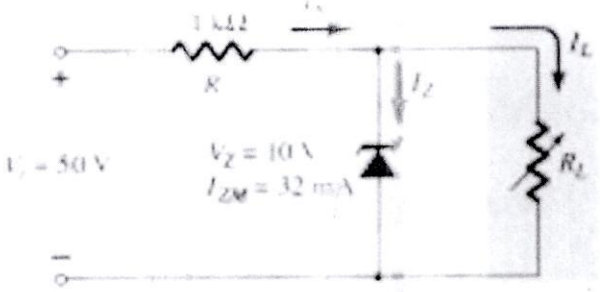

Figure 6.2: Zener Regulator

Question 7

a) For the Zener diode network of Figure 7.1 below, determine V_L, V_R, I_Z, and P_Z. Repeat with $R_L = 3\ k\Omega$. [5], [5]

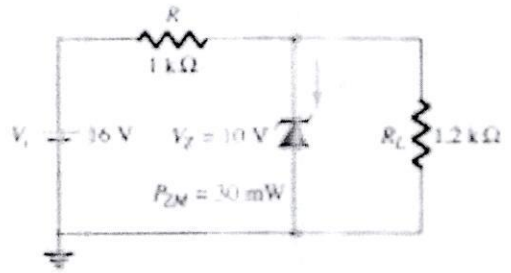

Figure 7.1: Bias Network

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. [10]

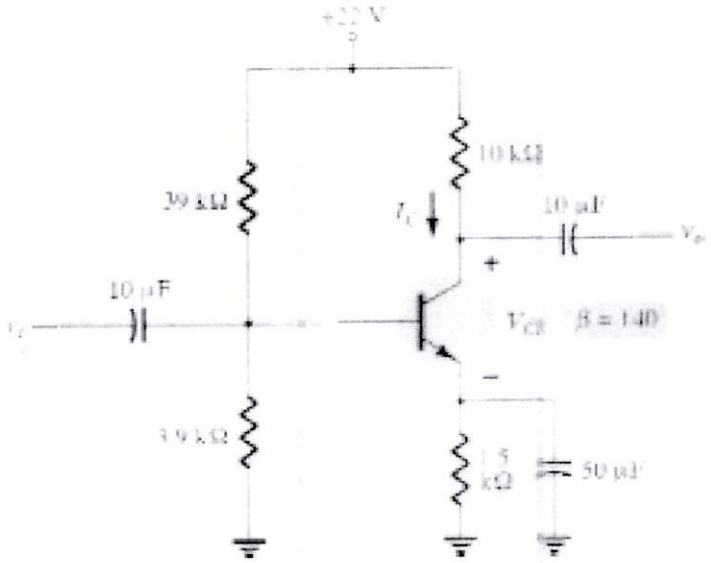

Figure 7.2: Voltage Divider Circuit