

CST 101-3 Basic Electricity and Electronics (Repeat)

Instructions to candidates

Duration: 03 Hours.

Number of questions: 06

Answer all questions.

Mark allocation: 180

1.

- a) State Kirchhoff's current law and Kirchhoff's voltage law.

(10 marks)

- b) Calculate the current through the resistors R_1 , R_2 , and R_3 in the circuit diagram shown in Figure 01 below using Kirchhoff's laws.

Clearly illustrate the steps.

(25 marks)

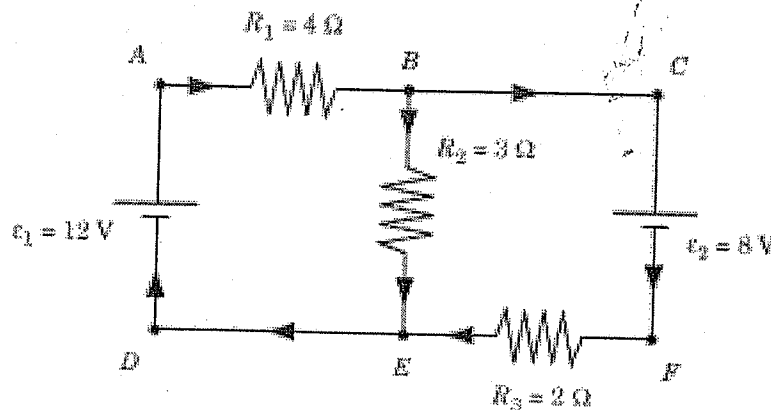
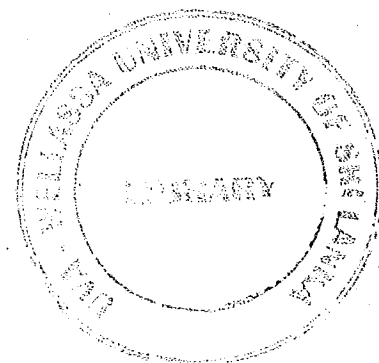


Figure 01



2.
a. State the thevenin's theorem.

(10 marks)

- b. Calculate the current through the $1.25\text{ k}\Omega$ resistor in the following circuit in Figure 02 using Thevenin's theorem. Clearly illustrate the steps. Also calculate the power dissipated in the $1.25\text{ k}\Omega$ resistor.

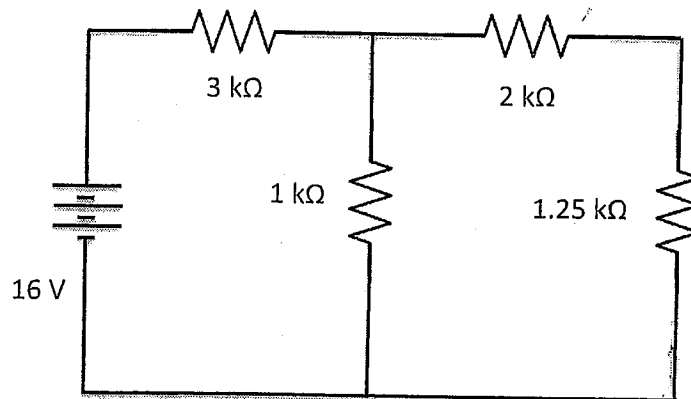


Figure 02

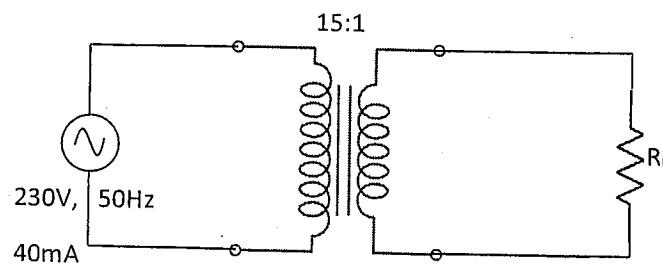
(30 marks)

3.
a. Write a relationship between turns ratio, voltage ratio, and current ratio of an ideal transformer.

(06 marks)

- b. Assuming the circuit diagram shown in Figure 03 is an ideal transformer, calculate current and voltage in the secondary coil.

(06 marks)



- c. Draw the detailed output waveform through R_L of the above circuit.

(03 marks)

4.

- a. An *npn* transistor is biased in the forward-active mode. The base current (I_B) is $7.50 \mu\text{A}$ and the collector current (I_C) is 1.50 mA . Determine current gain (β) and emitter current (I_E).

(12 marks)

- b. Calculate I_B , I_C , I_E and V_{CE} for the following circuit shown in Figure 04, given that $\beta = 100$ and $V_{BE} = 0.7 \text{ V}$.

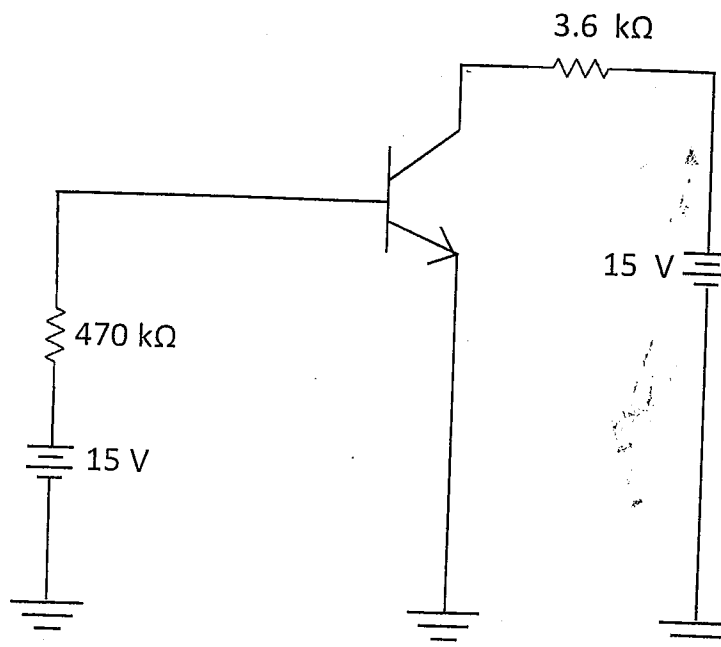


Figure 04

(18 marks)



5.

- a. Draw a detailed circuit diagram of a center tapped full wave rectifier.

(07 marks)

- b. For a center tapped transformer the primary rms voltage value is 230 V. The primary winding to secondary winding turn ratio is 20 : 1. Note that $V_{rms} = 0.707 V_{peak}$

I. What is the peak primary voltage ?

(04 marks)

II. What is the peak secondary voltage ?

(04 marks)

- c. A center tapped full wave rectifier is connected to the transformer.

I. What is the peak input voltage ?

(05 marks)

II. What is the peak output voltage ?

(05 marks)

III. Draw the input and output wave forms for the rectifier.

(10 marks)

6.

- a. What is the main function of a DC motor ?

(04 marks)

- b. Write down the four major parts of a DC motor.

(04 marks)

- c. Write short notes about the above mentioned four parts.

(12 marks)

- d. What is the unique characteristic of a zener diode ?

(05 marks)