

**Instructions to candidates**

Duration: Three (03) Hours.

Number of questions: Six (06)

Answer **all** questions.

Mark allocation: 160

1.

- a. Write a relationship between turns ratio, voltage ratio, and current ratio for an ideal transformer.

(06 marks)

- b. Assuming the circuit diagram shown in Figure 01 is an ideal transformer, calculate the current and voltage in the secondary coil.

(08 marks)

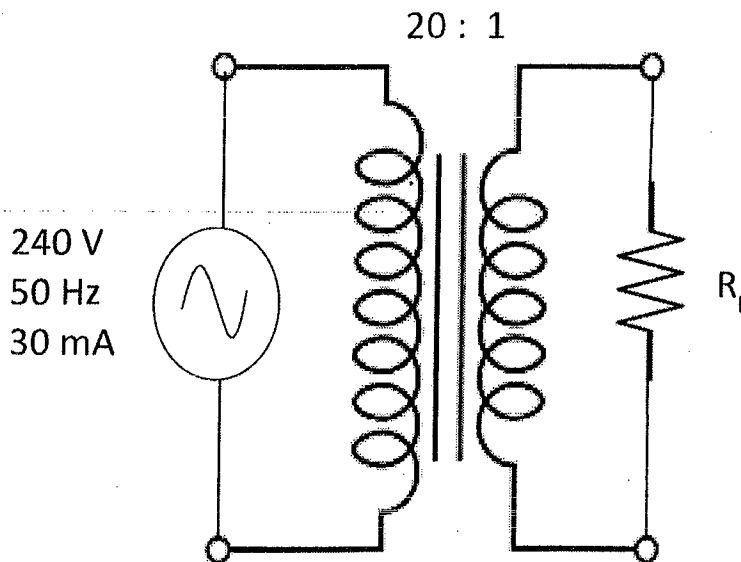


Figure 01



c. Draw the wave form through the load resistor  $R_L$  in Figure 01.

(06 marks)

2.

a) Write down Kirchhoff's current law and Kirchhoff's voltage law.

(10 marks)

b) Calculate the current through the resistors  $4\ \Omega$ ,  $2\ \Omega$ , and  $6\ \Omega$  in the circuit diagram shown in Figure 02 below using Kirchhoff's laws. Clearly illustrate the steps.

(15 marks)

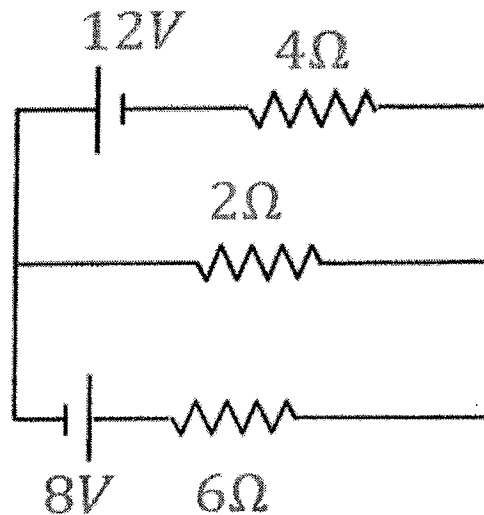


Figure 02

3.

a. What is Thevenin's theorem ?

(05 marks)

b. Calculate the current through the  $18\ \text{k}\Omega$  resistor in the following circuit in Figure 03 using Thevenin's theorem. Clearly illustrate the steps. Also calculate the power dissipated in the  $18\ \text{k}\Omega$  resistor.

(20 marks)

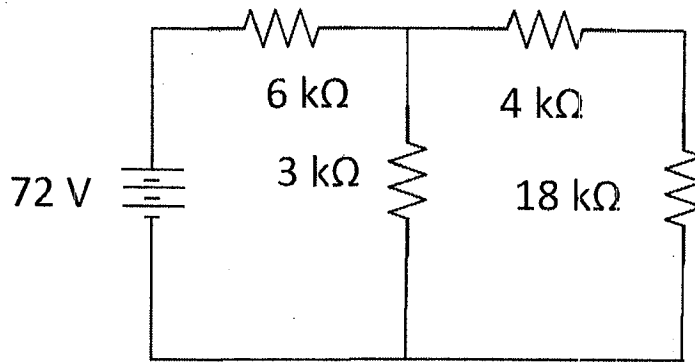


Figure 03

4.

- a. An *npn* transistor is biased in the forward-active mode. The base current is  $I_B = 5.00 \mu\text{A}$  and the current gain beta ( $\beta$ ) is 150. Determine collector current  $I_C$ , and emitter current  $I_E$ .

(10 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  $V_{BE} = 0.7 \text{ V}$ .

(20 marks)

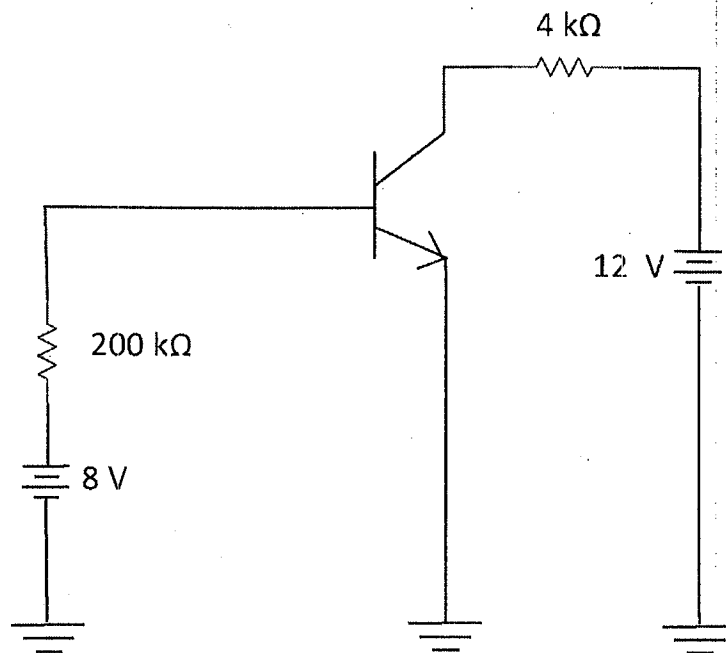


Figure 04



5.

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)

6.

a. Identify the section A and section B in the following circuit shown in Figure 05 and briefly write down the function of each section.

(08 marks)

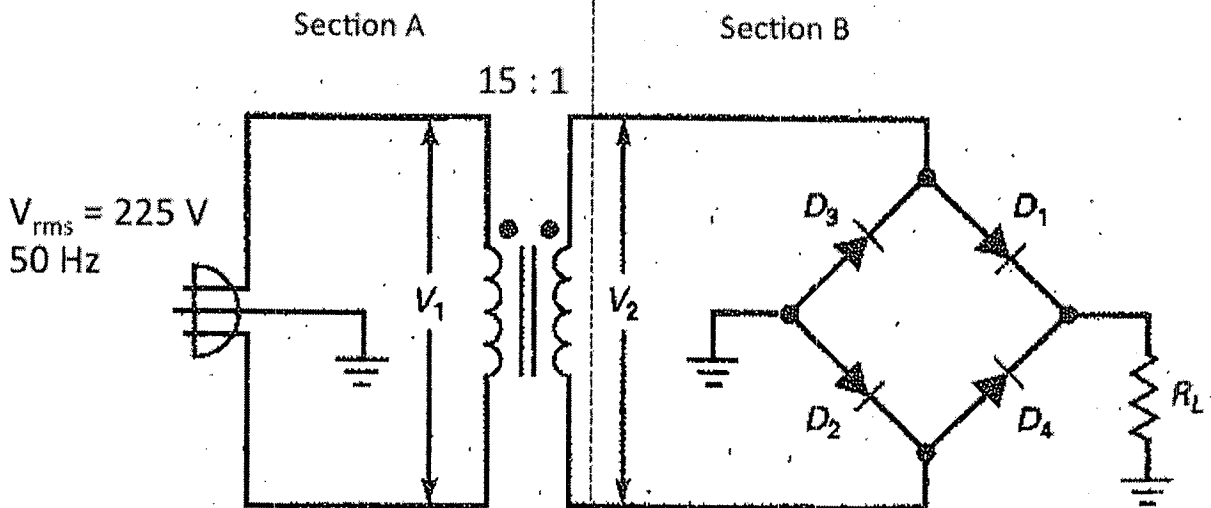


Figure 05

b. For the section A shown in Figure 05 above, the primary rms voltage value ( $V_{rms}$ ) is 225 V. The primary winding to secondary winding turns ratio is 15 : 1. Note that  $V_{rms} = 0.707 V_{peak}$

I. What is the peak voltage ( $V_{peak}$ ) of the primary winding ?  
(04 marks)

II. What is the peak voltage ( $V_{peak}$ ) of the secondary winding ?  
(04 marks)

c. Section B is connected to the section A as shown in figure 05 above.

I. What is the peak input voltage given by the section A to the section B ?  
(05 marks)

II. What is the peak output voltage given by section B to the load resistor  $R_L$  ?  
(05 marks)

III. Draw the input and output wave forms for the section B.  
(09 marks)

