



Instructions to candidates

Duration: 02 hours
Number of questions: 04
Answer **all** questions
Mark allocation: 150

Consider diode voltage (knee voltage) as 0.7 V for all the diodes.

1. a. In the following circuit shown in figure 01, identify each section A, B, C and write down the purpose of each section.

(08 marks)

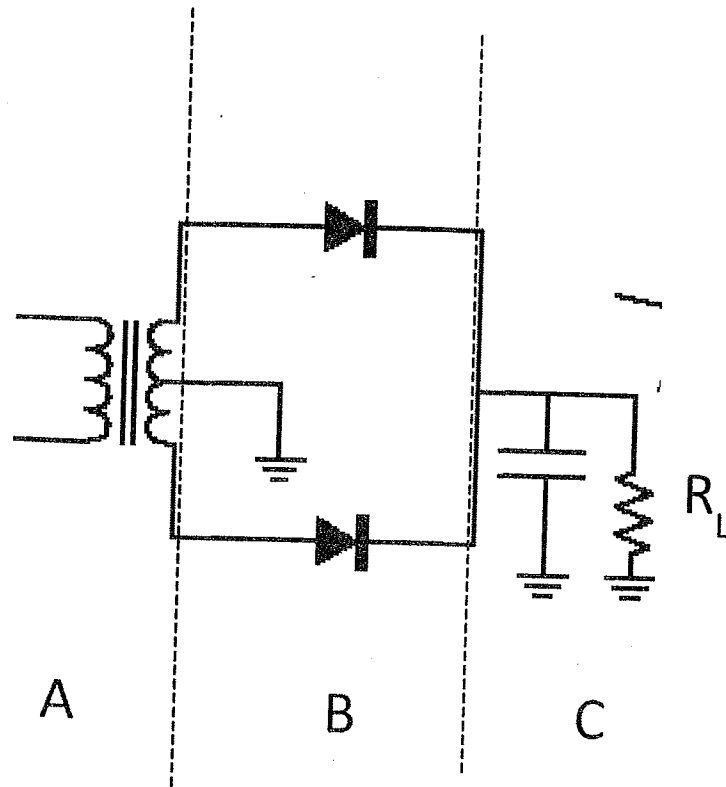


figure 01



- b. The primary *rms* voltage value used as the input for the section A of the circuit is 230 V. The ratio between primary winding and secondary winding is 15 : 1 .
- I. What is the peak primary voltage ?
(03 marks)
 - II. What is the peak secondary voltage ?
(03 marks)
- c.
- I. What is the peak input voltage for the section B of the circuit ?
(03 marks)
 - II. What is the peak output voltage from the section B of the circuit ? Consider the first approximation for the diodes.
(04 marks)
 - III. Draw the input and output wave forms for the section B of the circuit.
(06 marks)
- d.
- I. What is the dc voltage through the load resistor R_L ?
(03 marks)
 - II. Calculate the ripple voltage if the value of the load resistor R_L is $5\text{ k}\Omega$, the frequency of the input signal coming from section A is 50 Hz and the value of the capacitor is $100\text{ }\mu\text{F}$.
(08 marks)
 - III. Draw the waveform through the load resistor.
(04 marks)
- 2.
- a. Write down one unique characteristic of a Zener diode.
(04 marks)
 - b. Is the Zener diode in the following circuit given in figure 02 operating in the breakdown region ? Justify your answer.
(08 marks)

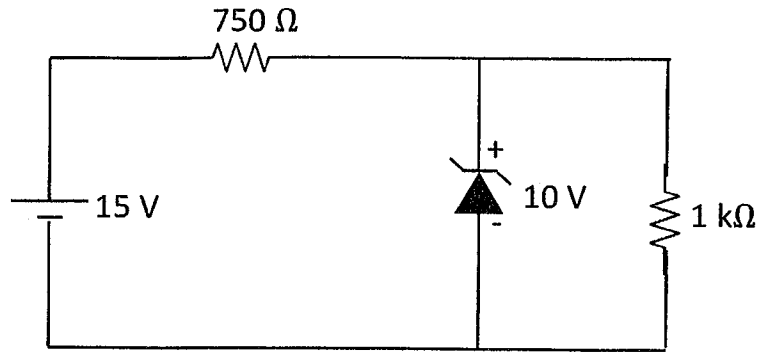


figure 02

- c. Some Zener diodes are used in wave shaping as shown in the following circuit in figure 03. If the input wave is sinusoidal with peak voltage V_P , draw the shape of the output wave through the load resistor R_L .

(06 marks)

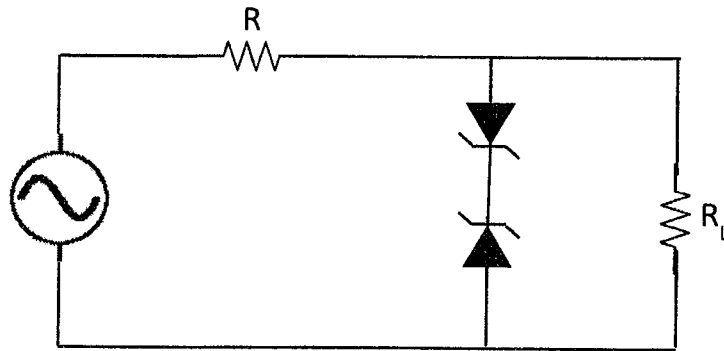


figure 03

- d. If the Zener voltage for each diode for the diodes shown in the circuit above is 5 V, what is the maximum and minimum voltage across R_L ?
- e. Zener diodes are used to produce nonstandard output voltages as shown in the following circuit in figure 04. If the Zener voltage for P and Q diodes in the following circuit are 10 V and 5 V respectively, calculate the voltages at points A, B, C and D.

(04 marks)

(16 marks)



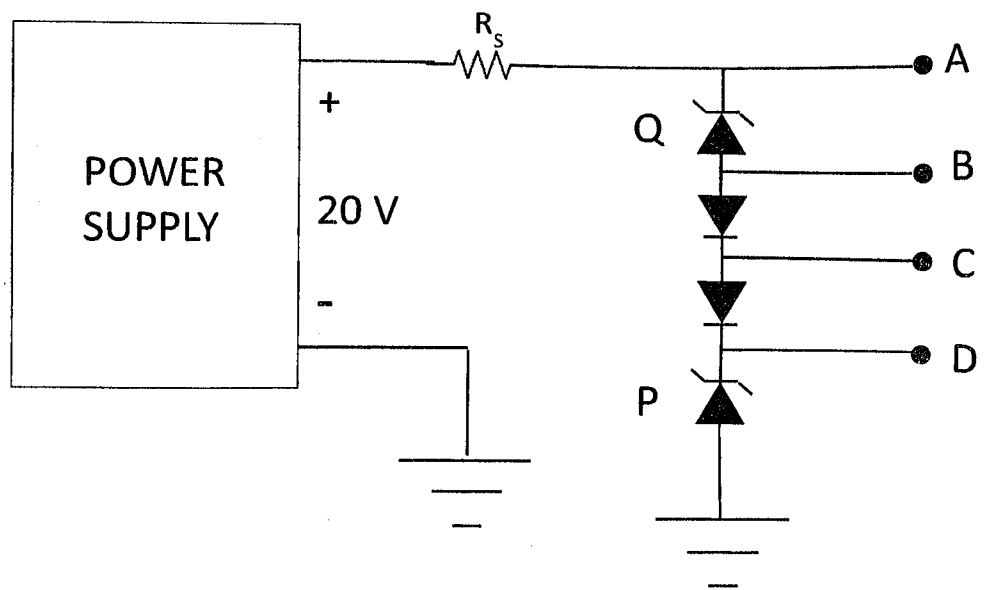


figure 04

- 3.
- Calculate the saturation and cutoff values for the following circuit given in figure 05. Use the ideal approximation for the diodes in the transistor.
- (8 marks)

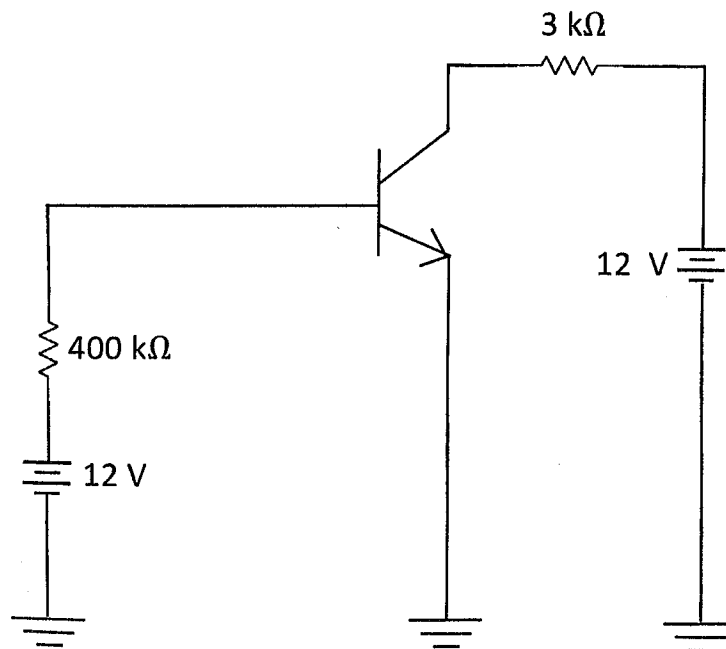


figure 05

b. Draw a graph of I_C vs V_{CE} representing the load line for the above circuit.

(7 marks)

c. Find the operating points corresponding to current gains 50, 100 and 120 for the above circuit and mark them on the load line. Use the ideal approximation for the diodes in the transistor.

(20 marks)

4.

a. What type of biased circuit (emitter biased or base biased) should be used as a transistor switch ?

(02 marks)

b. What type of biased circuit (emitter biased or base biased) should be used as a transistor amplifier ?

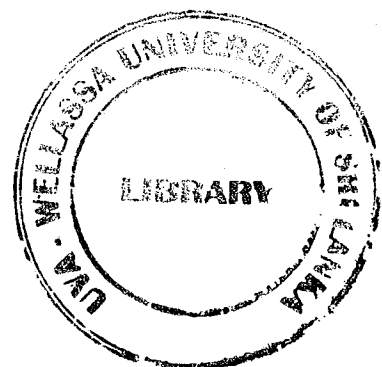
(02 marks)

c. Explain the reasons for your answers in part (a) and part (b) using the parameters, operating point Q and current gain β .

(06 marks)

d. Find the operating point in the following circuit shown in figure 06. Use the 1st approximation for diodes in the transistor. Write down any assumptions you make.

(25 marks)



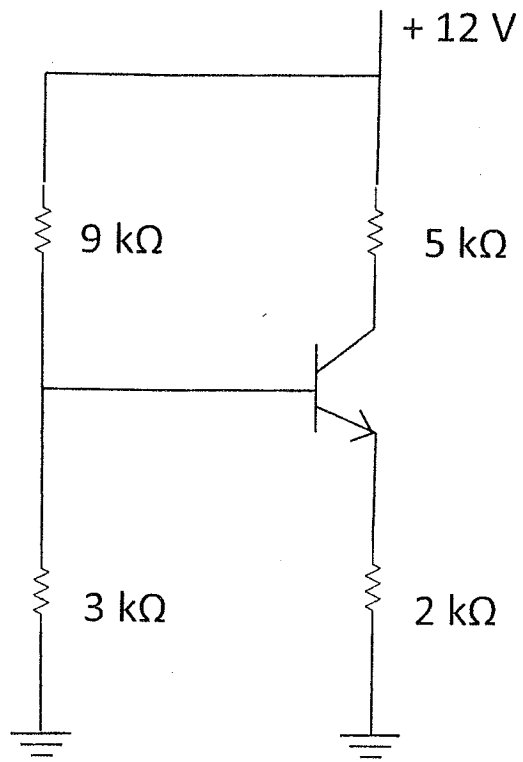


figure 06