53 (EC 201) BSEL

2019

BASIC ELECTRONICS

Paper : EC 201

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

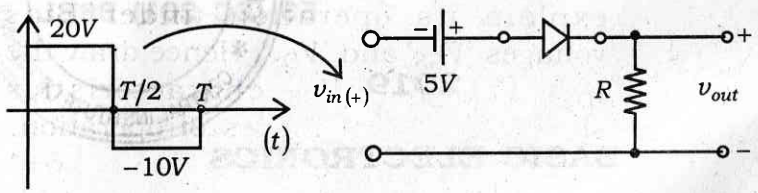
1. *(a)* Describe the operation of an *n-p-n* (BJT) Transistor and write the expression for terminal currents. 8

   (b) Derive a relationship between I_{CEO} and I_{CBO}. 2

   (c) Describe the Barkhausen's criteria for oscillations, draw the circuit diagram of Hartley's oscillator and explain its operation. 2+8

Contd.

2. *(a)* Find the output voltage for the following network and input signal. 5



(b) Write a short note on *n*-type material of semiconductors and give examples. 5

(c) Describe the common emitter configuration, draw the input and output characteristics with proper explanation of different operating modes. 10

3. *(a)* Describe the operation of a Center-tapped Bridge Rectifier, compare its performance parameters with a Bridge Rectifier. 7+3

(b) Write a short note on Light-emitting Diode (LED). 5

(c) Draw the input and output characteristics of an *n-p-n* transistor in Common-collector configuration and show various modes of operation. 5

4. *(a)* Draw the physical diagram of *n*-channel (Enhancement type) MOSFET and explain its operation under Bias voltages 'V_{GS}' and 'V_{DS}'. Hence draw the $I_{DS} \sim V_{GS}$, $I_{DS} \sim V_{DS}$ characteristics showing different modes of operation. 6+4

(b)

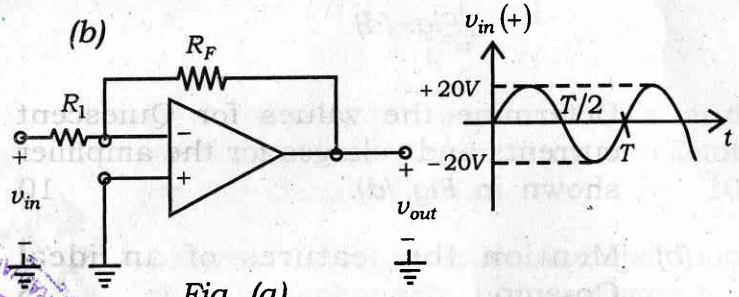


Fig. (a)

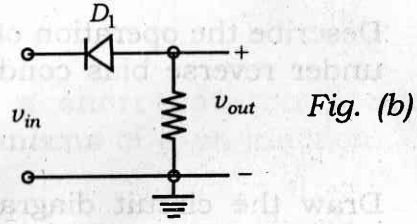


Fig. (b)

Derive the expression for voltage gain (v_{out}/v_{in}) assuming ideal Op-amp (*Fig. a*). 6

(c) Draw the output waveform for the circuit shown in *Fig. (b)* for input wave shown. 4

5. *(a)*

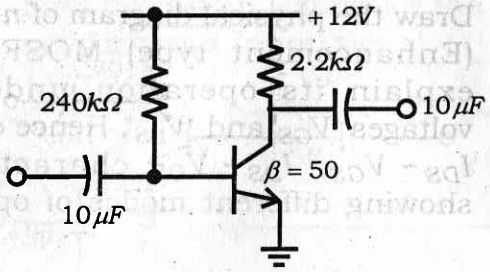


Fig. (d)

Determine the values for Quiescent currents and voltages for the amplifier shown in *Fig. (d)*. 10

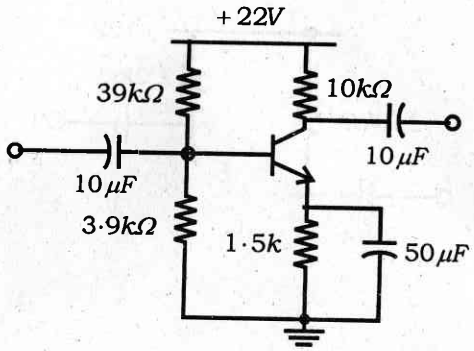
(b) Mention the features of an ideal Op-amp. 5

(c) Describe the operation of a *pn* junction under reverse bias conditions. 5

6. *(a)* Draw the circuit diagram for a non-inverting amplifier and derive expression for voltage gain. 10

(b) Describe the operation of Half-wave Rectifier, derive expressions for Average value, rms value of output voltage and hence find out the rectification efficiency. 10

7. *(a)*



Determine quiescent voltages and currents at 3 terminals of the transistor for the above amplifier. 10

(b) Describe the construction and operation of LCD display with proper diagram. 10

8. *(a)* Write a short note on breakdown mechanisms of a *pn* junction. 8

(b) Implement a 2-input OR gate using 2-input NAND and 2-input NOR gate. 8

(c) Define these terms : PIV, Pinch-off voltage. 4