

Time:

Max.Marks: 100

S.NO

Answer All Questions

Choice Options Marks CO

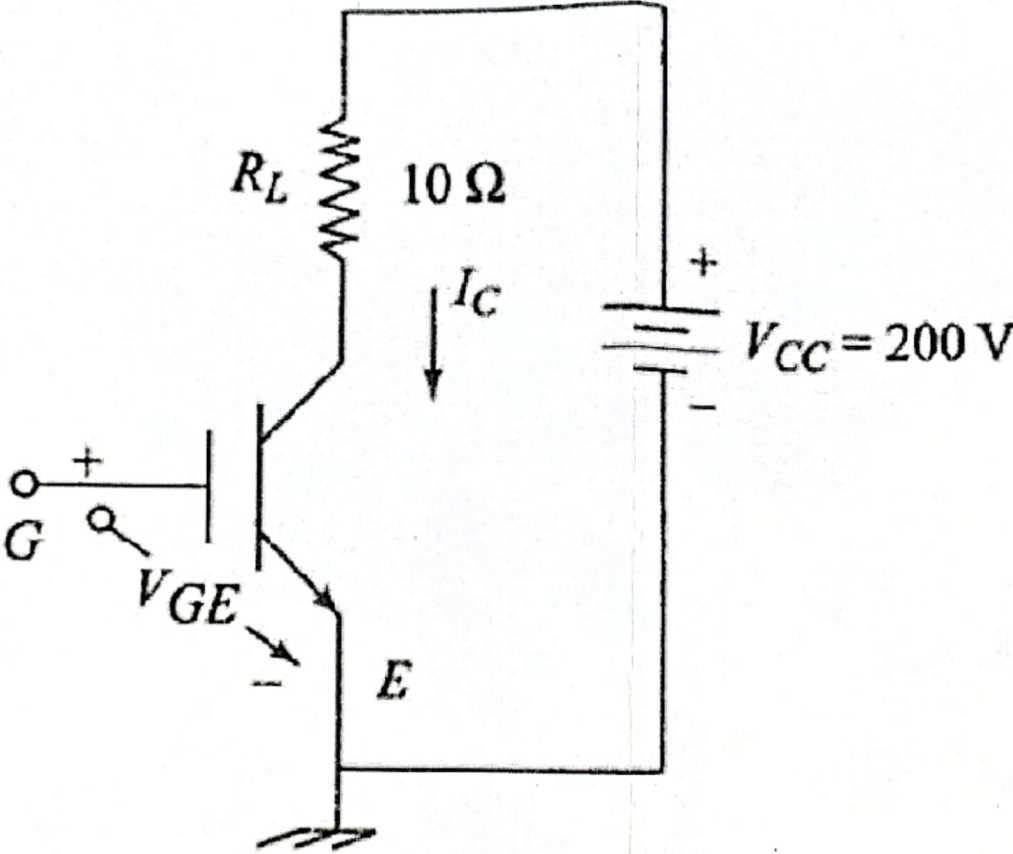
1. Elaborate on the dynamic characteristics of power MOSFET with the help of junction capacitance and necessary circuit diagram waveforms.

choice Q-2 10Marks CO1

2. Sketch the equivalent circuit diagram of IGBT. Also, Explain the steady-state characteristics of IGBT with necessary circuits and characteristics.

10Marks CO1

The IGBT used in the circuit is shown in the figure, has the following data, $t_{on} = 3 \mu s$, $t_{off} = 1.2 \mu s$, $D = 0.6$, $V_{ce(sat)} = 2V$, and $f_s = 10 \text{ kHz}$. Determine, i) average load current, ii) conduction power loss and iii) switching power loss during turn-on and turn-off time.

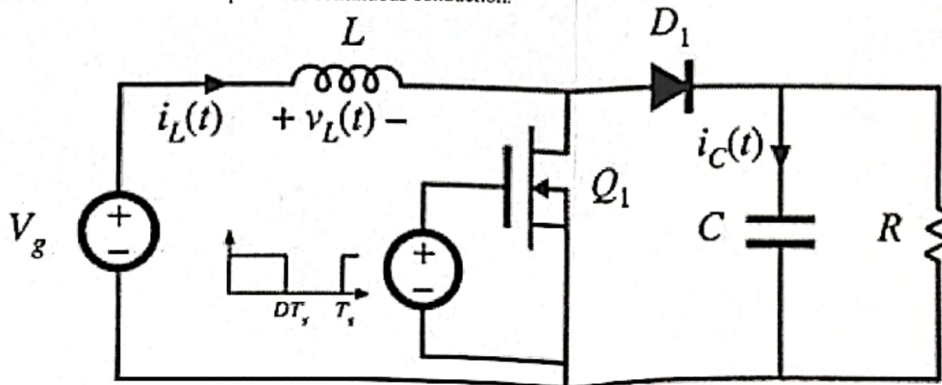


choice Q-4 15Marks CO1

4. Describe the switching characteristics of the Silicon Controlled Rectifier (SCR) during Turn-on and Turn-off transients with the necessary circuit diagram and waveforms.

15Marks CO1

5. Identify the given dc-dc converter type, also derive the expressions for inductor current ripple, capacitor voltage ripple, and minimum value of inductance required for continuous conduction.



choice Q-6 10Marks CO2

6. Illustrate the operation of the isolated forward dc-dc converter with neat circuit and waveforms. Also, derive the output voltage expression.

10Marks CO2

7. For the buck converter, $V_s = 24 \text{ V}$, $L = 200 \text{ mH}$, $R = 20 \text{ ohms}$, $C = 1000 \text{ micro-farad}$, $f = 10 \text{ kHz}$ switching frequency, $D = 0.4$, (a) Show that the inductor current is discontinuous, (b) Determine the output voltage V_o .

choice Q-8 15Marks CO2

8. Analyze a buck-boost converter to supply a load of 75 Watt 50 V from a 40-Vsource. The output ripple must be no more than 1 percent. Specify the duty ratio, switching frequency, inductor size, and capacitor size.

15Marks CO2

9. Brief the operation of a square-wave transistorized inverter. Assume R, RL, and RLC load. Draw the input voltage, output voltage, and current waveforms.

choice Q-10 10Marks CO3

10.	Illustrate the operation of IGBT-based 3-phase bridge inverter circuit diagram with resistive load in 180° conduction mode. Mention the switching states and trace the line and phase voltages.			10Marks	CO3
11.	The 3-phase inverter with 180° conduction mode has star-connected load of $R = 5 \Omega$ and $L = 23\text{mH}$. The inverter frequency is $f_o = 60 \text{ Hz}$ and the dc input voltage is $V_s = 220\text{V}$. Compute: i) the RMS line voltage, V_L ii) the RMS phase voltage, V_P iii) the RMS line voltage, V_{L1} at the fundamental frequency. iv) the RMS phase voltage, V_{L1} at the fundamental frequency. v) THD.	choice Q-12		15Marks	CO3
12.	Summarize the importance of Pulse Width Modulation (PWM) Techniques for controlling output voltage and frequency of the inverter. Describe and trace the waveforms of Bipolar PWM inverter with circuit and necessary waveforms.			15Marks	CO3
13.	Describe the operation of a single-phase AC voltage controller with a neat circuit diagram and output waveforms with respect to source voltage waveform at $\alpha = 60$ degrees fed with RL-load.	choice Q-14		10Marks	CO4
14.	Explain the operation of a three-phase fully controlled converter with inductive load. Also derive the expression for average output voltage.			10Marks	CO4
15.	A 3 - phase full converter is operated from a 3 - phase star connected to 415 V, 50 Hz supply and the load resistance is $R = 10 \Omega$. If it is required to obtain an average output voltage of 50 % of the maximum possible output voltage, calculate i) Delay angle ii) Rms and average output currents iii) The average and rms thyristor currents. iv) Rectification Efficiency	choice Q-16		15Marks	CO4
16.	A single-phase bidirectional controller supplies a resistance load of $R = 10 \Omega$. Determine the output voltage and power consumed by the load for following cases: (a) $\alpha = 30^\circ$ (b) $\alpha = 75^\circ$ (c) $\alpha = 120^\circ$. Observe the solutions and write the comments.			15Marks	CO4

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