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15EC73

Seventh Semester B.E. Degree Examination, Aug./Sept.2020
Power Electronics

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Give symbol , characteristic features of the following devices :
i) GTO ii) TRIAC iii) MOSFET. **(06 Marks)**

b. Explain different types of power electronic circuits with their input and output waveforms. **(06 Marks)**

c. Explain peripheral effects of power converter system. **(04 Marks)**

OR

2 a. Compare power MOSFET and bipolar junction transistor. **(04 Marks)**

b. Draw the switching model of MOSFET and explain its switching characteristics with neat figure. **(06 Marks)**

c. Explain output and transfer characteristics of IGBT. **(06 Marks)**

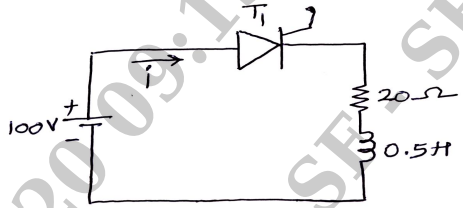
Module-2

3 a Explain the static anode – cathode characteristics of SCR. **(06 Marks)**

b. Explain the two transistor model of SCR and derive an expression for anode current in terms of current amplification factor and leakage current. **(06 Marks)**

c. The latching current of a thyristor circuit in fig.Q3(c) is 50mA. The duration of the firing pulse is 50μs. Will the thyristor get fired? **(04 Marks)**

Fig. Q3(c)



OR

4 a. Distinguish between natural and forced commutation with examples. **(04 Marks)**

b. With a neat sketch, explain turn – off mechanism of SCR. **(06 Marks)**

c. With the help of neat circuit diagram and waveforms, explain the UJT firing circuit. **(06 Marks)**

Module-3

5 a. With a circuit diagram and waveforms, explain the working of a single phase full converter with a highly inductive load. Derive an expression for the average output voltage and rms output voltage. **(08 Marks)**

b. With a neat diagram and waveforms, explain the principle of single phase dual converter. **(06 Marks)**

c. Explain the role played by the free – wheeling diode in converters with R – L load. **(02 Marks)**

OR

6 a. Explain the principle of ON – OFF control, with the help of waveforms and derive an expression for rms output voltage. **(06 Marks)**

b. An AC voltage controller has a resistive load of R = 10 and the rms input voltage is 120V, 60Hz. The thyristor switch is ON for n = 25 cycles and is OFF for m = 75 cycles. Determine i) rms output voltage ii) the input power factor iii) the average and rms current of thyristor. **(04 Marks)**

c. Explain the operation of a single phase bidirectional controller with resistive load. Derive an expression for rms output voltage. **(06 Marks)**

Module-4

7 a. Explain the operation of step – down converter with RL load. Also derive an expression for peak – to – peak load ripple current. **(08 Marks)**

b. Explain with suitable circuit and waveforms, the principle of operation of step – up converter. Derive an expression for average output voltage of step-up converter. **(08 Marks)**

OR

8 a. Briefly explain the classification of the converter depending upon the directions of the current and voltage flows. **(05 Marks)**

b. With the help of circuit diagram and waveforms, explain the working of a Buck regulator. Derive the expression for peak – to – peak ripple current of the inductor. **(11 Marks)**

Module-5

9 a. Explain the operation of single phase half bridge inverter with R - load. Derive the expression for rms output voltage. **(08 Marks)**

b. Explain the performance parameters of inverters. **(08 Marks)**

OR

10 a. Explain the working of variable dc – link inverter. **(08 Marks)**

b. With a circuit diagram and waveforms, explain the working of a single phase full wave switch. Also derive an expression for average current and rms current of each thyristor. **(08 Marks)**

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