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15EC73

Seventh Semester B.E. Degree Examination, July/August 2021 Power Electronics

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions.

- 1
 - a. What is Power Electronics? With the help of block diagram explain it. Explain any four applications of power electronics. (06 Marks)
 - b. With the transient model of MOSFET explain switching its characteristics. (06 Marks)
 - c. Compare between Bipolar Junction Transistor (BJT) and MOSFET. (04 Marks)

- 2
 - a. What are the peripheral effects of power electronic converter system? (04 Marks)
 - b. Explain briefly any two types of power electronic converters. (04 Marks)
 - c. Explain $\frac{di}{df}$ and $\frac{dv}{dt}$ protection for transistor. (08 Marks)

- 3
 - a. The SCR shown in Fig.Q3(a) has latching current of 40mA and is triggered by the pulse width of 50 μ sec. Determine whether the SCR turn ON or not.

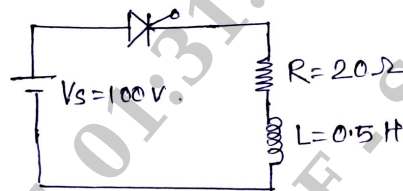


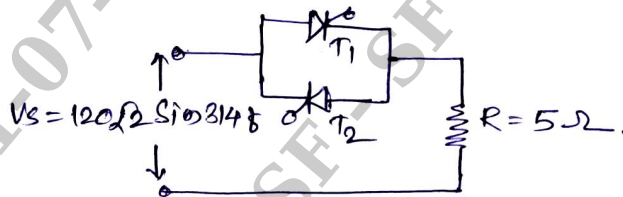
Fig.Q3(a)

- b. With the two transistor analogy of thyristor obtain the equation for anode current. (06 Marks)
 - c. Explain the operation of a full wave RC triggering circuit with waveforms. (06 Marks)

- 4
 - a. Explain class B LC communication with necessary circuit diagram, waveforms and equations. (08 Marks)
 - b. A UJT is used to trigger the thyristor whose minimum gate triggering voltage is 6.2V. The UJT ratings are : $\eta = 0.66$, $I_p = 0.5\text{mA}$, $I_v = 3\text{mA}$, $R_{B_1} + R_{B_2} = 5\text{k}\Omega$, leakage current = 3.2mA, $V_p = 14\text{V}$ and $V_v = 1\text{V}$. Oscillator frequency is 2KHz and capacitor $c = 0.04 \mu\text{F}$. Design the complete circuits. (08 Marks)

- 5
 - a. Explain the working of single phase half wave controlled rectifier connected to resistive load. Derive expression for the average DC output voltage and rms value of output voltage. (08 Marks)
 - b. With the neat circuit diagram and relevant waveforms explain the working of ON-OFF control for single phase AC voltage. Derive expression for rms output voltage. (08 Marks)

- 6 a. Explain the working of single phase dual converter with neat circuit diagram. Draw relevant waveforms. (08 Marks)
- b. For the single phase bidirectional AC voltage controller, delay angles of thyristors T_1 and T_2 are equal to $\alpha_1 = \alpha_2 = \frac{2\pi}{3}$. The input is $V_s = 120\sqrt{2} \sin 314t$, 50Hz. Calculate :
- rms output voltage
 - input power factor
 - average current through thyristors I_A and
 - rms current of thyristors. (Fig. Q6(b)).



(08 Marks)

- 7 a. Explain the working of stepdown chopper for resistive load with circuit diagram and waveform. Drive the expressions for average output voltage $V_{0(av)}$, rms output voltage $V_{0(rms)}$ and output power. (08 Marks)
- b. With the help of circuit diagram and waveforms explain the working of boost regulator. Derive the expression for peak to peak ripple output current and peak to peak ripple output voltage. (08 Marks)
- 8 a. Briefly explain the classification of choppers with circuit diagram, waveforms and quadrant diagram. (08 Marks)
- b. Input to the step-up chopper is 200V. The output required is 600V. If the conduction time of thyristor is 200μsec. Compute :
- Chopping frequency
 - If pulse width is halved of for constant frequency find the new output voltage. (08 Marks)
- 9 a. Explain the operation of single phase full bridge invertors supplying resistive load. Derive an expression for output RMS voltage. (08 Marks)
- b. Explain voltage control in inverter by single pulse width modulation and sinusoidal pulse width modulation. (08 Marks)

OR

- 10 a. With neat circuit diagram and waveforms explain transistorized current source inverter. (08 Marks)
- b. Write short note on solid state relays, and microelectronic relays. (08 Marks)

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