

CRASH COURSE

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10EC73

Seventh Semester B.E. Degree Examination, May 2017 Power Electronics

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions, selecting atleast TWO questions from each part.

PART – A

- With neat circuit diagram and waveforms, explain the control characteristics of GTO and MOSFET. (04 Marks)
 - What is power electronics? Briefly explain the relationship of power electronics to power, electronics and control. Mention any four power electronics applications. (08 Marks)
 - Explain with relevant circuit and waveforms, the dc-ac converter and dc-dc converter. Mention two applications of each. (08 Marks)
- With circuit diagram, explain the proportional base control. Mention few important points to be consider while designing the base drive of BJT. (08 Marks)
 - For the transistor switch of Fig.Q2(b), calculate:
 - β_f of transistor
 - The minimum ODF for β range 8 to 40
 - Obtain the power losses of the transistor

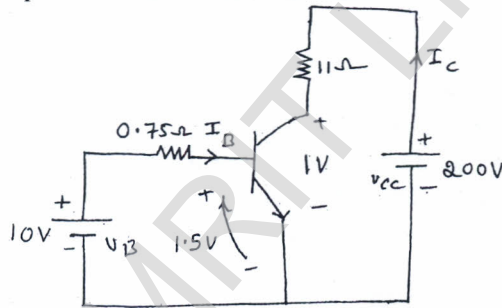


Fig.Q2(b)

- Compare BJT and MOSFET at least four. (04 Marks)
- Briefly explain the regenerative effect of thyristor by using two transistor model. Derive the anode current of thyristor I_A . (08 Marks)
 - The thyristor is gated with a pulse width of 40 μ sec, the latching current of thyristor is 36 mA and $V_s = 220$ V for a load of 60 Ω and 2H. Will the thyristor get turned on? If not how it can be overcome for the given load? (04 Marks)
 - With neat circuit diagram and waveforms, explain UJT triggering circuit. (08 Marks)
 - Explain with circuit diagram and waveforms, the single phase semi-converter with RL load for mode '1' operation ($0 \leq \omega t \leq \alpha$) when diode D_m conducts. Derive the load current. (10 Marks)
 - Explain in brief the principle of operation of a controlled rectifier. (04 Marks)
 - A single phase half wave converter is operated from a 120 V, 50 Hz supply and the load resistance is 10 Ω if the output voltage is 25% of the maximum possible average output voltage. Calculate: i) delay angle, ii) the rms and average output current. (06 Marks)

PART – B

- 5 a. Compare natural and forced commutation. (04 Marks)
 b. With circuit diagram and waveforms, explain the complementary commutation. Derive circuit turn-off time $t_{off} = 0.693 RC$. (10 Marks)
 c. In the resonant pulse commutation circuit of Fig.Q5(c) the supply voltage $V_s = 200$ V, load current $I_0 = 150$ A, capacitance $C = 20 \mu F$, inductance $L = 04$ mH. Determine the peak resonant reversing current of thyristor T_3 and turn off time t_{off} . Assume $V_0 = V_s$.

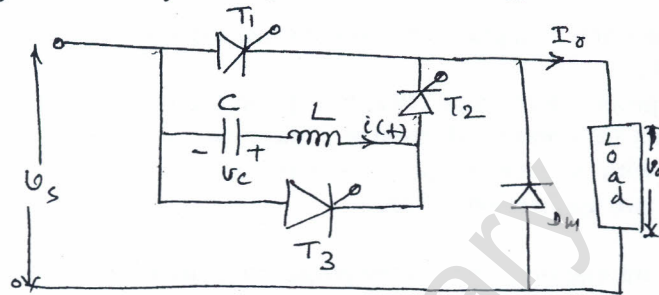


Fig.Q5(c)

(06 Marks)

- 6 a. With a necessary circuit and waveforms, explain the operation of single phase full wave controller with resistive load. Derive the expression for rms output voltage. (10 Marks)
 b. What is an ac voltage controller? Explain with circuit and waveforms the principle of phase control. Derive an expression for the rms output voltage. (10 Marks)
- 7 a. Explain with suitable circuit and waveforms, the principle of operation of step-up chopper. Derive an expression for average output voltage of step up chopper. (10 Marks)
 b. A dc chopper has a resistive load of 10Ω and the input voltage is 200 V. when the chopper switch is ON, its voltage drop is 2 V and the chopping frequency is 1 kHz, if the duty cycle is 50% , determine: i) average output voltage, ii) RMS output voltage, iii) the chopper efficiency. (06 Marks)
 c. Mention four applications of chopper. (04 Marks)
- 8 a. Briefly explain with circuit and waveforms, the principle of operation of single phase half bridge inverter with resistive load. (08 Marks)
 b. Discuss the voltage control of single pulse width modulation. (06 Marks)
 c. Write a brief note on single phase current source inverter. (06 Marks)

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