10EC73

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

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions.*

1 a. What are the important applications of power electronics? **(05 Marks)**
   b. With a neat circuit diagram and waveform, explain the control characteristics of SCR and BJT. **(05 Marks)**
   c. Explain different types of power electronics converter system. Draw their input and output waveforms. **(10 Marks)**

2 a. With a neat circuit diagram and waveform, explain the base drive control, during turn on method. **(06 Marks)**
   b. For the transistor switch shown in Fig. Q2 (b), calculate (i) Forced beta (β_f) of transistor. (ii) If the specified beta is in the range 8 to 40, calculate the minimum Over Drive Factor (ODF). (iii) Power loss P_T in the transistors. **(08 Marks)**
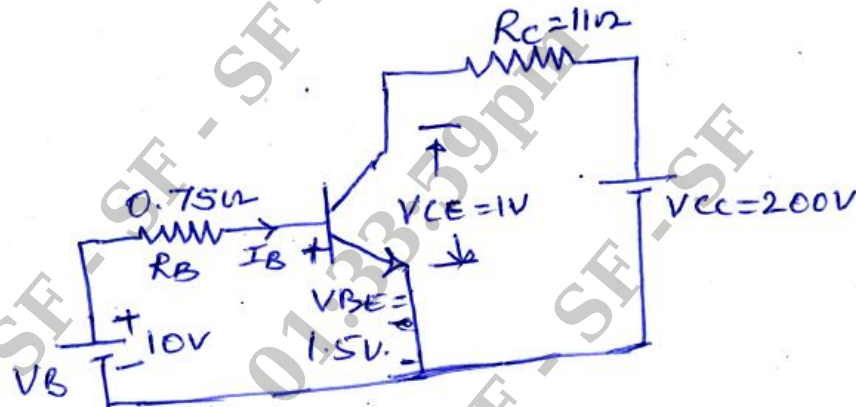

Fig. Q2 (b)

   c. What are the application, merits and demerits of MOSFET? **(06 Marks)**

3 a. With a neat circuit diagram and explain the two transistor model of an SCR. Derive anode current I_A. **(08 Marks)**
   b. With neat circuit diagram, explain the protection against $\dfrac{dV}{dt}$ and $\dfrac{di}{dt}$. **(08 Marks)**
   c. What are the features of firing circuits? **(04 Marks)**

4 a. With a neat circuit diagram and waveform, explain the single phase full wave semi-converter. **(08 Marks)**
   b. A single phase fully converter bridge rectifier is fed from 230 V, 50 Hz supply the load is highly inductive. Find the average load voltage and current. If the load resistance is 10 Ω and firing angle is 45°. Draw the supply current waveform. **(05 Marks)**
   c. With neat circuit diagram, explain the single phase dual converter. **(07 Marks)**

5 a. Distinguish between natural commutation and forced commutation. **(06 Marks)**
   b. Explain the method of self commutation by necessary circuit and waveform. **(07 Marks)**
   c. Explain the complementary commutation circuit. **(07 Marks)**

6 a. Draw the circuit diagram and waveform, explain the principle of ON-OFF control. Derive an expression for rms value of load voltage in ON-OFF AC voltage controller. **(12 Marks)**
   b. For the AC voltage controller shown in Fig.Q.6(b), calculate the average power in the lad if the thyristor firing angle is fixed at 45° with respect to supply voltage. Derive the necessary equation.
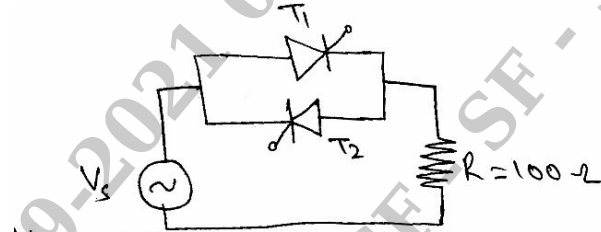
Fig.Q.6(b). **(08 Marks)**

7 a. Explain the basic principle of step-down chapper with waveform derive an expression for ,
      (i)   Average output voltage.
      (ii)   Output power
      (iii)   Effective input resistance interms of chopper duty cycle. **(10 Marks)**
   b. With the help of circuit diagram, waveform and quadrant diagram, explain the working of class E-chopper. **(10 Marks)**

8 a. Explain performance parameter of an inverter. **(06 Marks)**
   b. With a neat circuit and waveform explain the operation of single phase (full bridge) inverter with resistive load. **(08 Marks)**
   c. The single phase half bridge inverter has the DC input of 48 V. The load resistance is 4.8 m. Determine (i) RMS value of output voltage (ii) RMS value of fundamental component (iii) Total harmonic distortion. **(06 Marks)**

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