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BIEL-019

B.Tech. – VIEP – ELECTRONICS AND COMMUNICATION ENGINEERING (BTECVI)

Term-End Examination

December, 2017

00409

BIEL-019 : POWER ELECTRONICS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any* ***seven*** *questions. All questions carry equal marks. Use of scientific calculator is allowed. Missing data, if any, may be suitably assumed.*

1. (a) Explain the switching characteristics of power MOSFET. *5*

(b) Define di/dt and dv/dt rating of SCR. How is SCR protected against these ? *5*

2. (a) Draw and explain the I – V characteristics of a Diac. Also write down some applications of a Diac. *5*

(b) What is Form Factor ? Evaluate the value of form factor for the half wave and full wave rectifiers. *5*

3. With a circuit diagram, explain the operation of a three-phase full converter for constant load current. If the input to this circuit is three-phase, 50 Hz AC supply, determine the firing angle (α), for the SCR to obtain an output average DC voltage of 50% of the maximum. If the output voltage is 270 volts, calculate AC supply line and RMS line voltage. *10*

4. (a) Discuss the effect of source inductance on the performance of a single phase full converter. *5*

   (b) Explain the working of a voltage commutated chopper with the help of a circuit diagram and waveforms. *5*

5. (a) Describe the operating principle of a chopper with necessary diagram. *4*

   (b) The DC chopper shown in Figure 1 has a resistive load of R = 10 Ω and the input DC voltage V = 200 volts. When the chopper switch remains ON, its voltage drop is 2 volts and the chopper frequency is 1 kHz. If the duty cycle is 30%, determine : *6*

   (i) The average load voltage

(ii) RMS load voltage

(iii) Form factor and Ripple factor

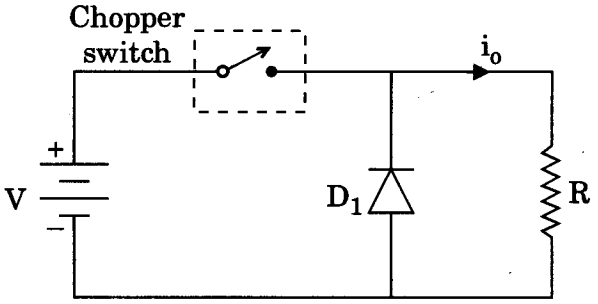

Figure 1

6. Draw and explain the operation of single-phase half-bridge voltage source inverters with their steady state analysis. *10*

7. (a) Why are thyristors not preferred for inverters ? Write down the various performance parameters of inverters. *5*

(b) What are the advantages of PWM control in inverters ? Compare half-bridge and full-bridge inverters. *5*

8. Describe the operation of separately excited drives for the single phase with necessary diagrams and waveforms. *10*

9. Draw and explain the operating principle of an induction motor with its characteristics. How is it different from a DC motor ? *10*

10. Write short notes on any ***two*** of the following : *2×5=10*

(a) Slip Power Recovery Scheme of Induction Motors

(b) Modified McMurray Half-Bridge Inverter

(c) Dual Converters