BIEL-019

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

Term-End Examination

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June, 2016

BIEL-019 : POWER ELECTRONICS

Time : 3 hours   *Maximum Marks : 70*

Note : *Attempt any **seven** questions. Draw neat waveforms and circuit diagrams. Use of scientific calculator is allowed. Missing data, if any, may be suitably assumed.*

1. Discuss the principle of working of a three-phase bridge inverter with an appropriate circuit diagram. Draw and explain phase and line voltage waveforms on the assumption that each thyristor conducts for 180°. The sequence of firing of various SCRs should also be indicated in the diagram. *10*

2. Sketch the switching characteristics of a GTO during its turn-on and turn-off processes. Show the variation of voltage across the GTO and current through it during these two dynamic processes. Indicate clearly the various intervals into which turn-on and turn-off times can be subdivided. Discuss briefly the nature of these curves. *10*

3. A single-phase bridge inverter may be connected to a load consisting of (a) R, (b) RLC overdamped, (c) RLC underdamped. For all these loads, draw the load voltage and load current waveforms under steady operating conditions. Discuss the nature of these waveforms. *10*

4. What is meant by step-up chopper ? Explain its operation. Sketch the input voltage, input current, output voltage and output current waveforms. State the various assumptions made. *10*

5. Discuss the effect of source inductance on the performance of a single-phase full converter indicating clearly the conduction of various thyristors during one cycle. *10*

6. What is Pulse Width Modulation (PWM) ? List the various PWM techniques. How do these differ from each other ? Explain. *10*

7. Discuss the various mechanisms by which thyristors can be triggered into conduction. *10*

8. For a type-A chopper feeding on RLE load, show that the maximum value of rms current rating for the freewheeling diode, in case load current is ripple free, is given by $0.3849 \dfrac{V_o}{R} \left(1 - \dfrac{E}{V_s} \right)^{3/2}$. *10*

9. What is regenerative braking ? Describe the regenerative braking of a chopper fed separately excited DC motor. Illustrate your answer with a circuit diagram and relevant waveforms. *10*

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

    (a)   Slip-power Recovery Scheme

    (b)   Speed Control of Induction Motors

    (c)   TRIAC