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BIEEE-018

B.Tech. – VIEP – ELECTRICAL ENGINEERING (BTELVI)

00363

Term-End Examination

December, 2016

BIEEE-018 : ADVANCED POWER ELECTRONICS

Time : 3 hours *Maximum Marks : 70*

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

1. (a) The turn-off process in a GTO can be described with its two-transistor model. Explain this in detail. *5*

(b) Explain the basic construction and operation of IGBT. *5*

2. Explain the constructional details and working of power MOSFET with its I – V characteristics. *10*

3. For a 3-phase full converter, explain how the output voltage wave, for a firing angle of 30°, is obtained by using

(a) phase voltages, and *5*

(b) line voltages. *5*

4. A single-phase semi-converter bridge feeds RLE load. Discuss how the freewheeling diode comes into operation and holds the output voltage to almost zero for a given firing angle delay. Sketch the time variation of supply voltage, E, load voltage and current, freewheeling diode current and current through each pair consisting of SCR and diode. Also find the circuit turn-off time. Assume the load current is continuous. *10*

5. A 3-phase semiconverter is connected to RLE load. For a firing angle delay of 120°, draw the output voltage and load current waveforms in case the load current is (a) continuous, and (b) discontinuous. Discuss briefly the nature of waveforms obtained. *10*

6. Explain the effect of blanking time on output voltage in a PWM inverter. *10*

7. A single-phase CSI is fitted with ideal SCRs. Describe its working for capacitive load. Show that the frequency of input voltage to CSI is twice the frequency of triggering the thyristors. *10*

8. Show that the performances of a single-phase full converter as affected by source inductance is given by the relation

$$\cos(\alpha + \mu) = \cos\alpha - \frac{\omega L_s I_0}{V_m},$$

where the symbols used have their usual meanings. *10*

9. Explain the operation of Thyristor Switched Capacitors (TSCs) with the help of neat waveforms. *10*

10. Explain the various methods of Reactive Power Compensation. *10*