

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

Term-End Examination

00766

June, 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) Describe the switching performance of a GTO with relevant voltage and current waveforms. 5
- (b) Give the merits and demerits of GTOs as compared to conventional thyristors. 5

2. Derive the approximate and exact equivalent circuits of an IGBT from its structural details. Also describe its output and transfer characteristics. 10

3. A 3-phase full converter is connected to a resistive load. Show that the average output voltage is given by $V_0 = \frac{3 V_{ml}}{\pi} \cos \alpha$ for $0 < \alpha < \frac{\pi}{3}$ and $V_0 = \frac{3 V_{ml}}{\pi} \left[1 + \cos \left(\alpha + \frac{\pi}{3} \right) \right]$ for $\frac{\pi}{3} < \alpha < \frac{2\pi}{3}$. 10
4. Describe the working of a single-phase full converter in the inverter mode with RLE load. Illustrate your answer with waveforms for source voltage, back emf, load voltage, load current, source current, current through and voltage across one SCR. Assume continuous conduction. Also find the circuit turn off time. Should the average output voltage be more than E during inverter operation? Discuss. 10
5. Sketch the output voltage waveform for a 3-phase semi-converter for a firing angle delay of 75° . Indicate the conduction of various elements and discuss whether freewheeling diode comes into play on the assumption of continuous load and current. Hence obtain an expression for the average output voltage by using both sine and cosine functions for the supply voltage. 10
6. Explain the square wave operation in a 3-phase inverter. 10

7. Describe a single-phase capacitor-commutated CSI connected to load R with the help of its power circuit diagram and waveforms for gating signals, load current, capacitor voltage, capacitor current, input voltage and voltage across one thyristor. 10

 8. Explain clearly the current regulated PWM voltage source inverter along with its applications. 10

 9. Explain the operation of Thyristor Controlled Reactors (TCRs) with the help of voltage and current waveforms. 10

 10. Clearly explain Static VAR Compensator. Explain its advantages. 10
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