

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

**Term-End Examination**

00116

**June, 2015**

**BIEE-024 : POWER ELECTRONICS**

*Time : 3 hours*

*Maximum Marks : 70*

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**Note :** *Attempt any five questions. Each question carries equal marks. Use of scientific calculator is permitted.*

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1. (a) Mention the various types of power semiconductor devices. Draw V – I characteristics and symbols of any two types. Also mention their important applications. 7
- (b) Describe the various turn-on methods of thyristors. Also explain the purpose of di/dt and dv/dt protection of thyristors. 7
2. Describe the working of three-phase semi-converter and derive the expressions for average output voltage and rms output voltage. 14
3. Explain the working of a three-phase full converter with 'R' load for the firing angles of 60°, 90° and 150°. 14

4. For a single-phase voltage controller, feeding a resistive load, draw the waveforms of source voltage, gating signals, output voltage and voltage across the SCR. Describe the working with reference to waveforms drawn. 14
5. (a) Compare the performance characteristics of MOSFET and BJT. 7
- (b) Briefly discuss the I – V characteristics of SCR. 7
6. (a) A boost regulator in Figure 1 has an input voltage of  $V_s = 5$  V. The average output voltage  $V_a = 15$  V and average load current  $I_a = 0.5$  A. The switching frequency is 25 kHz. If  $L = 150$   $\mu$ H and  $C = 220$   $\mu$ F, find (a) the duty cycle, (b) the ripple current of inductor, (c) the peak current of inductor, (d) the ripple voltage of filter capacitor and (e) the critical values of 'L' and 'C'. 10

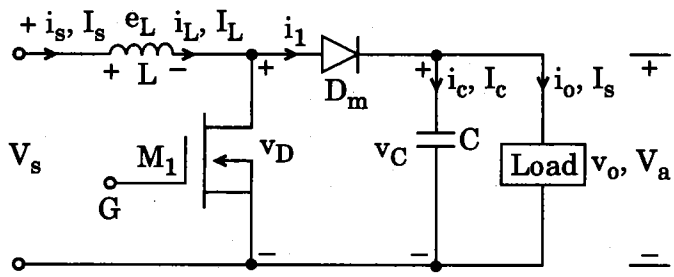


Figure 1

- (b) Prove that the output voltage of step-down chopper is  $V_o = D \cdot V_s$  where D is duty cycle. 4

7. Describe modified McMurray half-bridge inverter with appropriate voltage and current waveforms. For this circuit, find an expression that gives the circuit turn-off time for the main thyristor in terms of load current, peak capacitance current, etc. Also discuss how commutating circuit components can be designed on the basis of minimum commutation energy.

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