| BIEE-024 |

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

□□553   **Term-End Examination**

December, 2016

BIEE-024 : POWER ELECTRONICS

Time : 3 hours   *Maximum Marks : 70*

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

1. (a)   Draw and explain the characteristics of Power MOSFET.   5

   (b)   What are the differences between BJTs and IGBTs ?   5

2.   What is reverse recovery charge (Q_{RR}) of the power semiconductor diode ? The reverse recovery time of a diode is $t_{rr} = 3$ μs and the rate of fall of the diode current is di/dt = 30 A/μs. Determine

   (a)   the storage charge Q_{RR}, and

   (b)   the peak reverse current I_{RR}.   4+6

3. (a)   Draw and explain the I – V characteristics of a thyristor.   5

   (b)   Explain di/dt protection of a thyristor.   5

4. (a) Explain the principle of a single-phase thyristor converter with a resistive load. 5

(b) Why is the power factor of semi-converters better than that of full converters ? Differentiate between semi-converters and full converters. 5

5. In a single-phase full converter, the reduction in the output voltage due to the effect of source inductance is 3 volts. The load current I_0 is continuous and ripple-free equal to 100 Amp. Find the value of source inductance L_S and overlap angle μ, if the supply voltage is 230 V, 50 Hz and $\alpha = \pi/6$. 10

6. (a) Explain the working of cycloconverters. What are the advantages and disadvantages of cycloconverters ? 5

(b) Explain the operation of a step-down chopper with necessary circuit diagram and waveforms. 5

7. Discuss the operation of a single-phase half bridge inverter with necessary circuit diagram and waveforms. The single-phase half bridge inverter using transistors has a resistive load of 2 Ω. The DC supply is 24 V. Calculate : 10

(a) RMS output voltage at fundamental frequency

(b) Output power

(c) Average and peak load current

8. What are the various techniques of harmonic reduction in PWM (Pulse Width Modulation) inverters ? *10*

9. (a) Explain the need of commutation in a thyristor circuit. Describe any one type of commutation technique. *5*

    (b) Discuss the operation of switching mode regulators with necessary diagrams and waveforms. *5*

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

    (a) Impulse Commutation

    (b) Series and Parallel Operation of Thyristors

    (c) Dual Converters

    (d) Effect of Source Inductance in Converters