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BIEE-024

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

Term-End Examination

00902

December, 2017

BIEE-024 : POWER ELECTRONICS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. All questions carry equal marks. Use of scientific calculator is permitted. Assume suitable data, wherever not provided.*

1. Explain the working of Gate Turn-off Thyristors (GTO). Also draw its I – V characteristics. *10*

2. It is required to operate a 250-A SCR in parallel with a 350-A SCR with their respective on-state voltage drops of 1·6 V and 1·2 V. Calculate the value of resistance to be inserted in series with each SCR so that they share the total load of 600 A in proportion to their current ratings. *10*

3. Describe the gate trigger circuit for a single-phase full converter. Discuss how the adjustment of control voltage varies the firing-delay angle. *10*

4. Explain the need of commutation in thyristor circuits. Also, distinguish between voltage commutation and current commutation in thyristor circuits. *10*

5. A single-phase full converter delivers power to a resistive load R. For AC source voltage V_s, show that the average output voltage V_o is given by

$$V_o = \frac{\sqrt{2}\, V_s}{\pi} (1 + \cos \alpha).$$ *10*

6. A step-up chopper has input voltage of 220 V and output voltage of 660 V. If the non-conducting time of the thyristor-chopper is 100 μs, compute the pulse width of output voltage. Also find the new output voltage if pulse width is halved for constant frequency operation. *10*

7. Explain sinusoidal pulse-width modulation inverters. Discuss the conditions under which the number of pulses generated per half cycle are $\frac{f_c}{2f}$ or $\left(\frac{f_c}{2f} - 1\right)$, where f_c and f are the frequencies of carrier and reference signals, respectively. *10*

8. Describe the basic principle of working of single-phase to single-phase step-down bridge-type cycloconverter for both continuous and discontinuous conductions with the help of neat illustrations. *10*

9. Explain the operation of a transistor based 3-phase bridge inverter with resistive load in 120° conduction mode, with the help of suitable circuits and waveforms. *10*

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

(a) MOS Controlled Thyristors

(b) Dual Converter

(c) Effect of Source Impedance on the Performance of Converters