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BIEE-024

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

Term-End Examination

00033

June, 2018

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. Discuss the two transistor model of thyristor. Derive an expression for the anode current. *10*

2. Describe the working of a single-phase full converter with RL load. Draw the waveforms of supply voltage, load voltage, load current and voltage across the thyristor. *10*

3. A 3-phase M-3 converter is operated from a 3-phase, 230 V, 50 Hz supply with load resistance R = 10 Ω. An average output voltage of 50% of the maximum possible output voltage is required. Determine *10*
   (a) firing angle
   (b) average and rms value of load current
   (c) rectification efficiency.

4. Describe a voltage commutated chopper with relevant current and voltage waveform as a function of time. Show that effective on period for this chopper is load dependent. *10*

5. A step down chopper, fed from 220 V dc is connected to RL load with R = 10 Ω and L = 150 mH. Chopper frequency is 1250 Hz and duty cycle is 0·5. Calculate *10*

   (a) Maximum and minimum voltage of load current

   (b) Maximum value of ripple current

   (c) Average and rms values of load current

   (d) RMS value of chopper current.

6. With a neat circuit diagram explain the working of a current source inverter. *10*

7. Discuss the working principle of single-phase to single-phase step up cycloconverter with the help of bridge type configurations. *10*

8. What is commutation ? Discuss the operation of impulse commutation with the help of a neat circuit and relevant waveforms. *10*

9. The full bridge inverter has a source voltage V_{dc} = 220 V. The inverter supplies an RLC load with R = 10 Ω, L = 10 mH and C = 52 μF. The inverter frequency is 400 Hz. Determine *10*

(a) The rms load current at fundamental frequency

(b) The rms value of load current

(c) The power output

(d) Average value of supply current

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

(a) VI characteristics of SCR

(b) TRIAC

(c) di/dt and dv/dt protection of SCR

(d) On-off control of AC voltage controller