

**B.Tech. ELECTRONICS AND
COMMUNICATION ENGINEERING
(BTECVI)**

Term-End Examination

00414

June, 2014

BIEL-019 : POWER ELECTRONICS

Time : 3 hours

Maximum Marks : 70

***Note :** Attempt any **five** questions in all. All questions carry equal marks. Missing data if any may be suitably assumed. Use of calculator is permitted.*

1. (a) Explain the two-transistor analogy of the thyristor with neat schematic diagram and equivalent circuit. 10
- (b) Compare the features of GTO with those of a conventional thyristor. 4

2. (a) What are dual converters ? Explain the operation of a three-phase dual converter using circulating current mode of operation. How are firing angles of two converters controlled ? 10
- (b) What are the effects of a freewheeling diode in a single phase converter ? 4

3. (a) Draw the circuit diagram of a four-quadrant chopper and explain how it can be used for control of motors in various quadrants. 7
- (b) A chopper is working at a frequency of 400 Hz, on a 220 V dc source. It is controlled to give an average dc voltage of 88 V. The load contains a resistance of 10 ohms in series with an inductance of 50 mH. The turnoff time of the thyristor is 18 μ s. The peak current through the thyristor should be limited to 150% of the average value of the maximum possible load current.
- Determine
- (i) the on and off periods of chopper.
- (ii) the upper and lower limits of load current. 7
4. (a) Draw the circuit of a McMurray-Bedford inverter and describe its operation. 10
- (b) Explain how the inverter voltage waveform can be improved. 4
5. (a) Explain why regenerative braking of a chopper based dc series motor is more complicated than that of a separately excited motor. 7
- (b) A 220 V, 24 A, 1000 rpm separately excited dc motor has an armature resistance of 2 Ω . The motor is controlled by a chopper with switching frequency of 500 Hz and source voltage of 230 V. Calculate the duty cycle when the torque becomes 1.2 times the rated torque at 500 rpm ? 7

6. (a) Discuss stator voltage control with constant slip frequency as applied to an induction motor. What are its merits and demerits? 7
- (b) Explain slip power recovery scheme with neat diagram. Also, write their advantages. 7
7. Write short notes on any *two* of the following: $2 \times 7 = 14$
- (a) Power MOSFET
- (b) Single phase PWM inverter
- (c) Speed control of induction motor
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