

Power Electronics-II

QP Code : 5939

(3 Hours)

[Total Marks :80

- N.B. : (1) Question no. 1 is compulsory.
 (2) Solve any three questions out of remaining five questions.
 (3) Figures to the right indicate full marks.
 (4) Solve one complete question together.
 (5) Assume suitable data wherever necessary.

1. Attempt any four from the following:-

- (a) What are the advantages of SVM over the conventional Sine wave PWM? Explain. 5
 (b) List the merits and demerits of online and offline UPS. 5
 (c) Explain regenerative braking for DC motors. 5
 (d) Explain in brief the effect of source inductance in single phase fully controlled bridge rectifier. 5
 (e) Explain the concept of UPS and give classification of UPS system. 5
2. (a) Explain clearly the steps involved in Space Vector Modulation for three phase voltage source inverter. 10
 (b) A single phase full-wave mid-point converter with freewheeling diode as shown below in Fig. Q2(b) is supplied from a 120V, 50 Hz supply with a source inductance of 0.33 mHenry. Assuming that the load current is continuous at 4A, find the overlap angle for
 (i) Transfer of current from a conducting thyristor to the commutating diode.
 (ii) From the commutating diode to a thyristor when the firing angle is 15 degree.

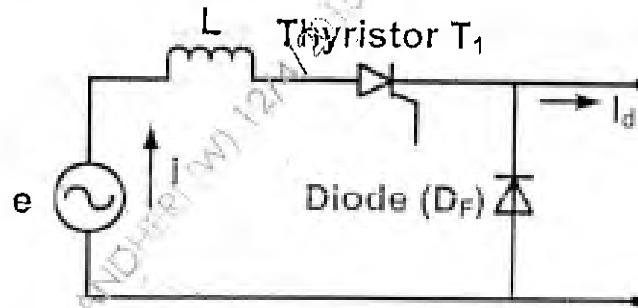


Fig.Q2. (b)

3. (a) Derive and explain the state-space model of Buck converter. 10
 (b) Explain the PI (Proportional + Integral) control of DC-DC converter with the help of neat diagram. 10
4. (a) Derive the expressions for output voltage and current for a single phase fully controlled bridge rectifier with source inductance using equivalent circuit. 8
 (b) What are SMPS? Give classification and explain any SMPS circuit in detail. 6
 (c) Draw and explain the battery charging circuit involving power electronics system. 6

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5. (a) A separately excited DC motor is supplied from 230V, 50Hz source through a single-phase half wave controlled converter. Its field is fed through single-phase semi-converter with zero degree firing angle delay. Motor resistance = 0.70Ω , Motor constant = 0.5 volts sec/rad. For a rated load torque of 15 NM at 1000 rpm and for continuous ripple-free current, determine:

- (i) Firing angle delay of the armature converter.
- (ii) RMS value of thyristor & freewheeling diode current.
- (iii) Input power factor of the armature current.

(b) Explain various methods of speed control for 3-phase induction motor. 10

6. Write short notes on:

- (a) Comparison of fly-back and forward converters used in SMPS. 7
- (b) Power electronics applications in induction heating. 6
- (c) Slip power recovery scheme for induction motor using Kramer Drive below sub-synchronous speed. 7