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B.Tech. 5th Semester Electrical Engg.-I Examination

December-2013

POWER ELECTRONICS

Paper-EE-317-F

Time allowed : 3 hours]

[Maximum marks :100

Note : Question No. 1 is compulsory from section A .

*Attempt four questions from remaining four sections
selecting one question from each section..*

Section - A

1. (i) Draw and explain static V-I characteristic of a power diode.
- (ii) Differentiate A.C. drives and D.C. drives.
- (iii) Differentiate $\frac{dV}{dt}$ and $\frac{dI}{dt}$ protection of thyristors.
- (iv) Explain SIT with their industrial application.
- (v) Explain and draw characteristic of GTO 20

Section - B

2. (a) Explain role of power electronics in detail. 10
- (b) Draw and explain ckt deagram, V-I characteristics and transfer characteristics of IGBT. 10

3. For an SCR, gate cathode characteristic is given by $V_g = 1 + 10I_g$. Gate source voltage is a rectangular pulse of 15V with 20 μ sec duration. For an average gate power dissipation of 0.3 W and peak gate drive power of 5W, compute 20
- (a) the resistance to be connected in series with the SCR gate.
- (b) the triggering frequency.
- (c) the duty cycle of the triggering pulse.

Section - C

4. Explain series and parallel operation of thyristors in detail. 20
5. Explain five thyristor Turn on methods in detail. 20

Section - D

6. (a) Explain three phase regulator. 10
- (b) Design snubber circuits with explanation. 10
7. Explain voltage commutated chopper with current and voltage waveforms. 20

Section - E

8. (a) Explain three phase to single phase cycloconverters. 10

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(b) Derive o/p voltage equation for a cycloconverter. 10

9. A single phase bridge inverter delivers power to a series connected RLC load with $R=2\Omega$ and $\omega L=10\Omega$. The periodic time $T=0.1\text{msec}$. What value of C should the load have in order to obtain load commutation for the SCRs. The thyristor turn off time is $10\ \mu\text{ sec}$. Take circuit turn off time as $1.5t_q$. Assume that load current contains only fundamental component. 20