Code No.: 9A02601/R09

B.Tech. III Year II Semester Regular & Supplementary Examinations **Set-1**

April/May - 2013

POWER SEMICONDUCTOR DRIVES

(Electrical and Electronics Engineering)

Time: 3 Hours Max. Marks: 70

*Answer any **FIVE** Questions*

***All** Questions carry **equal** marks*

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1. (a) Explain the operation of single phase semi-converter fed separately excited D.C motor drive with necessary diagrams.

   (b) A D.C shunt motor operating from a 1-ϕ half controlled bridge at a speed of 1450 r.p.m has an input voltage 330 sin 314 t and a back e.m.f 75 V. The SCRs are fired symmetrically at $\alpha = \pi/3$ in every half cycle and the armature has a resistance of 5 Ω. Neglecting armature inductance, find the average armature current and the torque.

2. Describe the use of three phase semi converter for the speed control of a D.C series motor. Illustrate your answer with appropriate waveforms and also derive the r.m.s values of source and thyristor currents.

3. (a) Explain how four-quadrant operation is achieved by dual converters each of 3 ϕ full wave configuration for D.C separately excited motor.

   (b) Distinguish between circulating current and non-circulating current mode of operation.

4. (a) Distinguish between class A and class B choppers with suitable examples of speed control of motors.

   (b) A D.C supply of 220 V supplied power to separately excited D.C motor via a class A thyristors chopper. The motor has an armature circuit resistance of 0.03 Ω and inductance of 3 mH. The chopper is fully on at the rated motor speed 1200 r.p.m when the armature current is 50 A. If the speed is to be reduced to 1000 r.p.m with the load torque constant, calculate the necessary duty cycle.

5. Describe the operation of reversible induction motor drive fed by an A.C voltage controller for four quadrants of operation.

6. Explain the operation of voltage source inverter fed induction motor drive with neat diagram.

7. (a) State the major features of rotor resistance control of wound rotor induction motor.

   (b) The speed of a 3-phase slip ring induction motor is controlled by variation of rotor resistance. The full load torque of the motor is 50 N-m at a slip of 0.3. The motor drives load having a characteristic of $T \propto N^2$. The motor has 4 poles and operated on 50 Hz, 400 V supply. Determine the speed of the motor for 0.8 times the rated torque. The operation condition is obtained with additional resistance in the rotor circuit by chopper control. Determine the average torque developed for a time ratio of 0.4.

8. Explain the operation of three pulse midpoint cyclo-converter fed self controlled synchronous motor with the help of neat sketches.