NR

Code.No: 52104/MT

M.Tech. I-Semester Regular Examinations, March-2008.

POWER ELECTRONIC CONTROL OF DC DRIVES
(Common to Power Electronics & Electric Drives, Power & Industrial Drives and Power Electronics)

Time: 3 hours **Max. Marks: 60**

Answer any FIVE questions
All questions carry equal marks.

1.a) Describe the working of a single-phase semi converter fed dc separately-excited motor with relevant waveforms and expressions.

b) A 200V, 1000rpm, 10A separately, excited dc motor is fed from a single-phase full converter with ac source voltage of 230V, 50Hz. Armature circuit resistance is 1Ω. Armature current is continuous. Calculate firing angle for
   i) rated motor torque at 500 rpm
   ii) half the rated motor torque at (-500) rpm.

2.a) With appropriate voltage and current waveforms, explain the operation of three phase full converter fed dc drive.

b) Write short notes on the following:
   i) Purpose of Free wheeling diode
   ii) Continuous and discontinuous modes.

3.a) Explain the operation of three phase controlled bridge rectifier inverter with neat diagram.

b) Analyse the effect of resistive load and inductive load connected to the three phase controlled bridge rectifier.

4. Give the steady state analysis of three phase
   a) Converter Controlling the DC motor drive
   b) What is the purpose of a converter in dc drives? And classify them.

Contd...2

5.a) Design a current and speed controller for a DC Motor Drive.

b) The speed of a separately excited dc motor is controlled by a single-phase full wave converter. The field circuit is also controlled by a full converter and field current is set to maximum possible value. The ac supply voltage to the armature and field converters is 1ϕ, 440V, 60Hz. The armature resistance is $R_a = 0.25\Omega$, The field circuit resistance is $R_f = 175\Omega$, The motor voltage constant is K_v = 1.4V/Arad/s. The armature current I_a is 45 A. The viscous friction and no load losses are negligible. The delay angle of the armature converter is $\alpha_a = 60^0$ & I_a is 45A. Determine

i) The torque developed by the motor T_d
ii) The speed ω, and
iii) The input PF of the drive. (The I_a & I_f are continuous and ripple free).

6.a) Explain the principle of operation of chopper in the four quadrant circuit along with the model.

b) What is pulsating torque? And give the details of rating of the devices generally used?

7.a) Explain pulse width modulated current controller.

b) Distinguish between speed and current closed loops fed to a dc motor drive.

8. Write short notes on the following:
a) Dynamic Simulation
b) Current Controller
c) Speed Controller.

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