

**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.**

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- 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  $1\Omega$ . 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.

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- 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  $1\phi$ , 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  $K_v = 1.4V/\text{Arad/s}$ . 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  $\alpha_a = 60^\circ$  &  $I_a$  is 45A. Determine
- The torque developed by the motor  $T_d$
  - The speed  $\omega$ , and
  - 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:
- Dynamic Simulation
  - Current Controller
  - Speed Controller.

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