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Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)



II SEMESTER M.TECH (POWER ELECTRONICS SYSTEMS AND CONTROL)

END SEMESTER EXAMINATIONS, MAY 2016

SUBJECT: POWER SEMICONDUCTOR CONTROLLED DRIVES [ELE 506]

REVISED CREDIT SYSTEM

Time: 3 Hours

05 MAY 2016

MAX. MARKS: 50

Instructions to Candidates:

- ✤ Answer ANY FIVE FULL questions.
- Missing data may be suitable assumed.
- Sine graph sheets shall be supplied, if required.
- 1A. Explain the four quadrant operation of a motor driving a hoist load. (04)
- 1B. Explain the block diagram of DC CLM drive and draw its speed torque characteristics. (06)
- 2A. A 220V, 1200 rpm, 80A separately excited dc motor has armature resistance 0.2Ω , which is fed from a single phase full converter with ac input 230V, 50Hz for continuous conduction. Determine a) firing angle for rated motor torque at -700 rpm, b) motor speed for $\alpha = 150^{\circ}$ and half rated torque. (04)
- 2B. A 220V, 1500 rpm, 50A separately excited dc motor with armature resistance of 0.5Ω is fed from a three phase fully controlled rectifier. The available ac source has a line voltage of 440V, 50Hz. A star-delta connected transformer is used to feed the armature, so that the motor terminal voltage equals the rated voltage when the converter firing angle is zero. Calculate the transformer turns ratio and determine the value of firing angle when i) The motor is running at 1200 rpm and rated torque, ii) The motor is running at 800 rpm and twice the rated torque.
- 3A. Explain the working of two quadrant class D chopper supplying a separately excited DC motor and draw the gate signals, source current, output voltage and current waveforms for $(0 < t_{\alpha} < T_p/2)$ operation. (05)
- 3B. A 230V, 1750 rpm, 74A dc motor has an armature resistance of 0.180Ω and is driven with its armature supplied from a class A chopper and a 240V dc source, given rated operation on 230V. The chopping frequency is constant at 500Hz. If the average armature current is equal to the rated value and t_{on} is at the setting that gives the largest harmonic content, determine i) motor speed, ii) rms armature current, iii) rms and line current ripple factors. (05)
- 4A. Explain the direct vector control scheme of AC motors with a neat block diagram. (05)
- 4B. With a neat diagram explain the sub synchronous speed control of static scherbius drive. (05)

5A. Explain the AC Commutator less motor drive with a neat diagram.

- 5B. Explain the back emf detection control scheme of BLDC motor.
- 6A. Explain line notching and its effect on line impedance distribution also brief about its reduction methods. (05)
- 6B. Explain the role of active filters in power quality improvement of electric drives in detail. (05)

(05)

(05)

(06)