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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Seventh Semester, B.E. - Electrical and Electronics Engineering

Semester End Examination; Dec. - 2014

AC and DC Drives

Time: 3 hrs

Max. Marks: 100

Note: Answer any FIVE full questions, selecting at least TWO full questions from each part.

PART - A

1. a. With neat circuit and waveform, explain the working of single phase fully controlled rectifier feeding separately excited DC shunt motor for motor operation. Write the equation for speed in terms of its voltage 10
- b. A 220 V, 960 rpm, 12.8 A separately excited DC motor has armature circuit resistance and inductance of 2 ohm and 150 mH respectively. It is fed from a single phase half controlled rectifier with an AC source voltage of 230 V, 50 Hz calculate. 10
 - i) Motor torque for $\alpha = 60^\circ$ and $N = 600$ rpm
 - ii) Motor speed for $\alpha = 60^\circ$ and $T = 20$ N-m
- 2 a. Explain the four quadrant operation of DC separately excited motor with relevant diagram and their notations. 10
- b. A 220 V, 1500 rpm, 50 A separately excited motor with armature resistance of 0.5Ω is fed from a 3-phase fully controlled rectifier. Available AC source has a line voltage of 440 V, 50 Hz. A star – delta connected transformer is used to feed the armature so that motor terminal voltage equals rated voltage when converter firing angle is zero. 10
 - I) Calculate transformer turns ratio
 - II) Determine the value of firing angle when
 - i) Motor is running at 1200 rpm and rated torque.
 - ii) Motor is running at – 800 rpm and twice the rated torque.

Assume continuous condition.
- 3 a. With neat circuit, waveforms and speed torque characteristics, Explain motoring and regenerative Braking operation of DC shunt motor when fed from copper circuit. 10
- b. A 230 V, 960 rpm and 200 A separately excited DC motor has an armature resistance of 0.02Ω . The motor is fed from chopper which provides both motoring and braking operations. The source has a voltage of 230 V. Assuming continuous conduction, 10
 - i) Calculate duty ratio of copper of motoring operation at rated torque and 350 rpm.
 - ii) Calculate duty ratio for braking operation at rated torque and 350 rpm.
 - iii) If maximum duty ratio of chopper is limited to 0.95 and maximum permissible motor current is twice the rated, calculate maximum permissible motor speed obtainable without field weakening and power fed to the source.

- 4 a. With the help of block diagram, explain the closed loop control operation of DC drive. 10
- b. What is meant by PLL? With the help of block diagram explain the concept of PLL control. 10

PART - B

- 5 a. Explain the operation of 3 – phase Induction motor when operated from variable frequency control. Sketch $\omega_m - T$ characteristic. Explain the need of V/f ratio constant. 10
- b. Explain the operation of 3 – phase Induction motor when fed from VSI. State the disadvantages of stepped wave Inverter. 10
6. a Explain the operation of 3- phase Induction motor when fed from CSI. 10
- b. With neat circuit explain how speed control is achieved by static scherbius drive system. 10
- 7 a. With neat circuit, explain how speed control is achieved in self controlled synchronous motor by employing load commuted thyristor inverter. 10
- b. Explain how control is done in self controlled synchronous motor drive employing cycloconverter. 10
- 8 a. With the help of line diagram of a cement mill explain the working and necessity of the different drive system. 10
- b. How paper is manufactured? Explain:
- I) Pulp manufacture
- II) Paper manufacture with the following sections;
- i) Wire or couch section 10
- ii) Dryer section
- iii) Press section
- iv) Calendar section
- v) Reel section

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