Code No: 09A60202 **R09** **Set No. 2**

III B.Tech II Semester Examinations,April/May 2012
POWER SEMICONDUCTOR DRIVES
Electrical And Electronics Engineering

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain the principle of closed loop control of chopper controlled dc drive using suitable block diagram.
   (b) A 230V, 960 rpm and 200A separately excited dc motor has an armature resistance of 0.02Ω. The motor is fed from a chopper which provides both motoring and braking operations. The source has a voltage of 230V. Assuming continuous conduction, calculate duty ratio for motoring operation at rated torque and 350rpm. [15]
2. Explain the CSI operation of IM. State the advantages of this scheme. [15]
3. (a) What are the torque speed characteristics of IM?
   (b) What are various means for speed control of IM? [7+8]
4. Explain the power and control circuit for a synchronous motor under constant terminal voltage and frequency. [15]
5. In which way can slip power recovery scheme be made operable for both super synchronous and sub synchronous speed control? [15]
6. (a) Explain the closed loop operation of DC motors with a neat block diagram.
   (b) A 220V, 20kW dc shunt motor running at its rated speed of 1200 rpm is to be braked by plugging. The armature resistance is 0.1Ω and the rated efficiency of the motor is 88%. Determine (i) the resistance to be connected in series with the armature to limit the initial braking current to twice the rated current (ii) the initial braking torque. [15]
7. A 3-phase fully controlled converter is feeding a DC series motor load. Derive the expressions for average output voltage, maximum average output voltage, normalized average output voltage and the rms value of the output voltage. [15]
8. A 220V, 960 rpm, 12.8 A separately excited dc motor has armature circuit resistance and inductance of 2Ω and 150mH, respectively. It is fed from a single-phase half-controlled rectifier with an ac source voltage of 230V, 50Hz. Calculate
   (a) Motor torque for α=60^0 and speed = 600rpm.
   (b) Motor speed for α=60^0 and T = 20Nm. [15]

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Code No: 09A60202 **R09** **Set No. 4**

III B.Tech II Semester Examinations,April/May 2012
POWER SEMICONDUCTOR DRIVES
Electrical And Electronics Engineering

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What is two-quadrant chopper; mention their types, importance and applications?
   (b) Draw the circuit diagram of two-quadrant chopper for separately excited DC motor and relevant waveforms for I and II quadrant operation. [15]

2. (a) Discuss about the basic characteristics of a separately excited dc motor indicating constant power and constant torque regions.
   (b) Explain the different modes of operation of 1-Φ fully controlled rectifier-fed separately excited motor for motoring mode of operation. [15]

3. (a) Explain various types of braking in DC motors.
   (b) A 220V, 500rpm, dc shunt motor with an armature resistance of 0.08 ohm and full load armature current of 150 amperes is to be braked by plugging. Estimate the value of resistance which is to be placed in series with the armature to limit the initial braking current to 200 amperes. What would be the speed at which the electric braking torque is 70% of its initial value. [15]

4. Discuss briefly the stator voltage control scheme of induction motor. Also, draw and explain the speed torque curves. [15]

5. The speed of a 100kW, 1000rpm, separately excited dc motor is controlled by a three phase full converter. The specifications of the converter are 460V, 300A. The input to the converter is a 3-Φ, 415V, 50 Hz ac supply. Determine (a) firing angle of the converter and power factor at rated speed.(b) firing angle and power factor at 10% rated speed. [15]

6. How the speed and power factor of a wound rotor induction motor are controlled by injecting a voltage in the rotor circuit? What should be the relation between the frequency of the injected voltage and the frequency of the rotor induced voltage. [15]

7. Compare VSI & CSI fed synchronous motor drives- mention advantages and disadvantages of each method. [15]

8. Write short notes on the following:-
   (a) Cyclo-converter fed IM
   (b) CSI fed IM operation. [15]

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Code No: 09A60202 **R09** **Set No. 1**

III B.Tech II Semester Examinations,April/May 2012
POWER SEMICONDUCTOR DRIVES
Electrical And Electronics Engineering

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Why the stator voltage control is an inefficient speed control method?
   (b) Describe the operation of AC voltage controllers. [7+8]

2. (a) Explain the time ratio control, current limit control in case of chopper fed dc motors
   (b) A 230V, 960 rpm and 200A separately excited dc motor has an armature resistance of 0.02Ω. The motor is fed from a chopper which provides both motoring and braking operations. The source has a voltage of 230V. Assuming continuous conduction, calculate duty ratio for motoring operation at rated torque and 350rpm. [15]

3. (a) Explain various types of braking in DC motors.
   (b) A 220V, 1500rpm, 50A separately excited motor with armature resistance of 0.5Ω, is fed from a circulating current dual converter with ac source voltage (line) = 165V, 50 Hz. Determine the converter firing angles, when motoring at rated motor torque and 1000rpm. [7+8]

4. (a) Draw and explain a closed loop operation for a static Kramer controlled drive.
   (b) Why static Kramer control is different from static scherbius drive? [15]

5. (a) Explain the different modes of operation of 1-Φ fully controlled rectifier-fed separately excited motor.
   (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 half the rated motor torque at (-500) rpm. [15]

6. Compare voltage- and current-source inverters in terms of their reliability, control complexity, and harmonics. [15]

7. A 220V, 1500rpm, 50A separately excited motor with armature resistance of 0.5Ω, is fed from a 3-Φ fully controlled rectifier. Available ac source voltage has a line voltage of 440V, 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. Assuming continuous conduction,
   (a) Calculate transformer turns ratio.
   (b) Determine the value of firing angle when

i. motor is running at 800 rpm and rated torque

ii. motor is running at -800 rpm and twice the rated torque. [15]

8. Discuss the VSI method of speed control of synchronous motor describe the operation of the converter with waveforms. [15]

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Code No: 09A60202 **R09** **Set No. 3**

III B.Tech II Semester Examinations,April/May 2012
POWER SEMICONDUCTOR DRIVES
Electrical And Electronics Engineering

Time: 3 hours **Max Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What are the advantages of current control?
   (b) What is the greatest shortcoming in a voltage-source inverter? [15]
2. Describe the various methods of speed control of synchronous motor in details.[15]
3. What are the effects of line side inductance in a slip-power recovery scheme? [15]
4. (a) Explain the operation of chopper fed DC series excited motor.
   (b) Explain the principle of closed loop control of chopper controlled dc drive using suitable block diagram. [15]
5. (a) Draw the output voltage of 3- Φ full bridge converter for a firing angle of 120^0 considering DC motor as load? Assume continuous ripple free load current.
   (b) Explain the use of freewheeling diode in the converter fed dc drives. Take and example and explain its affect on the machine performance. [15]
6. A 3 phase star connected 440V, 50HZ 4 pole IM has the following per phase parameters refferd to stator: R_1=0.25Ω, X_1=0.35Ω, R_2'=0.22Ω, X_2'=0.45Ω, X_m=30Ω. Compute the stator current and pf when the motor is operated a rated voltage and frequency with s=0.05. [15]
7. (a) Explain how four quadrant operation can be achieved through dual converters.
   (b) A 220V, 1500rpm, 50A separately excited motor with armature resistance of 0.5Ω, is fed from a circulating current dual converter with ac source voltage (line) = 165V, 50 Hz. Determine the converter firing angles, during braking operation at rated motor torque and (-1000) rpm. [15]
8. 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:
   (a) rated motor torque at 500 rpm
   (b) half the rated motor torque at (- 500) rpm. [15]

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