Total No. of Questions :8] *[Total No. of Printed Pages :2*

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MEPE-201

M.E./M.Tech., II Semester

Examination, December 2016

Solid State Controllers of Drives

Time : Three Hours

Maximum Marks : 70

Note : i) Attempt any five questions.

ii) Each question carries 14 marks. Part a and b carries 7 marks each.

1. a) Draw and explain the torque speed curves with variable frequency control for the following two different modes:
   i) Operation at constant flux
   ii) Operation at constant V/f ratio
   b) Show that a variable frequency I/M drive develops the same torque at all frequencies for a given slip-speed when operating at constant flux.

2. a) Why slip-power recovery scheme is suitable mainly for drives with a low speed range?
   b) How the speed and power factor of I/M are controlled by injecting a voltage in rotor circuit?

3. How is the output of a VSI improved by PWM techniques? Explain how this converter can be used for speed control of synchronous motor?

4. Describe CSI fed and VSI fed synchronous motor drives in details with block diagram and compare them.

5. Write short notes on following :
   a) DC link static scherbius drive
   b) Cycloconverter static scherbius drive

6. a) Explain the principle of speed control of a DC motor and show how it can be achieved by a chopper.
   b) Derive the expression for average motor current and motor torque for chopper fed DC series motor.

7. A three phase full converter is used to control the speed of a 220V, 3.73 kW, 1200 rpm dc separately excited motor. The AC supply is 240V, 50 Hz. The motor EMF constant is 1.7 Vs/rad. The armature resistant is 1.5Ω. for $\alpha = 60°$, the motor speed is 800 RPM.
   Determine :
   a) Average value of motor current
   b) RMS value of thyristor current
   c) Supply power factor

8. Explain the operation of a VSI (180° conduction) used for induction motor speed control. Draw neat wave forms of the line voltages show that the phase voltage is a six-step voltage waveform.

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