C.o.E.Pune

Department of Electrical Engineering

End Semester Examination-2014

Subject: - Industrial Drives (EE(DE)-14010)

Branch: B.Tech (Electrical)

Total: 60 marks

Time :- 2 to 5 p.m.

Time: 03 hr

Date: -

28 NOV 2014

Instructions:-

(i) All the questions are compulsory

(ii) Make necessary assumptions and assume suitable data wherever required

(iii) Figures to the right indicate full marks

		Marks
Q.1	a) What are the main factors which decide the choice of electrical drive for a given application?	5
	b) Why current sensing is required in electrical drives? what are the common methods of current sensing	5
Q.2	a) The speed of a 15 hp, 220 V, 1000 rpm dc series motor is controlled using a 1 ϕ half controlled bridge converter. The combined armature and field resistance is 0.2 Ω. Assuming continuous and ripple free motor current and speed of 1000 rpm and k=0.03 Nm/amp^2, determine 1) Motor current 2) Motor torque for firing angle $\alpha=30^o$. Ac voltage is 250 V.	5
	b) A dc chopper is used to control the speed of a separately excited dc motor. The dc supply voltage is 220 V, R_2=0.2 Ω and motor constant $K_a\phi$=0.08 V/rpm. This motor drives a constant torque load requiring an average armature current of 25 A. Determine 1) The range of speed control 2) The range of duty cycle α. Assumed the motor current to be continuous	5

Q.3	a) Why starting is required for 3 ϕ induction motor. What are the different starting methods for it?	4
	b) A 3 phase, 20 KW, 4 pole, 50 Hz, 400 V delta connected induction motor has he following parameters per phase: r_1=0.6 Ω, r_2=0.4 Ω, x_1=x_2=1.6 Ω, its magnetizing reactance is neglected. If this motor is operated at 200 V, 25 Hz with DOL starting, calculate 1) Current and pf at the instant of starting and under maximum torque conditions; compare the results with normal values, 2) Starting and maximum torques and compare with normal values	6
Q.4	a) A 3 ϕ, 400 V, 50 Hz, 4 pole, star connected reluctance motor, with negligible resistance, has X_d=8 Ω and X_q=2 Ω. For a load torque of 80 N-m, calculate 1) The load angle 2) The line current and 3) The input power factor. Neglect rotational losses.	6
	b) When rotor speed is close to N_s, application of dc field leads to pull in of the rotor into synchronism. However, the application of dc field at a speed considerably lower than N_s does not lead to pull in of the rotor in to synchronism, why?	4
Q.5	a) What are the main features of stepper motors which are responsible for its wide spread use?	4
	b) Explain the operation of Trapezoidal PMAC drive	6
Q.6	a) Why energy conservation is important in electrical drives?	4
	b) What is the basic difference between true synchronous mode and self control mode for variable frequency control of synchronous motor?	3
	c) When started on no load, a salient pole synchronous motor pulls into synchronism even before dc excitation applied, why?	3