B.E (Electrical) sem VIII – CBSGS – 16/5/18

Drives & Control

Q. P. Code: 13626

1/2

Instructions:

- Question No: 1 is compulsory.
- Answer any three from the remaining five questions.
- Figures to the right indicate full marks.
- Answers to questions should be grouped and written together.

Q1	a)	Mention the important factors which decide the choice of an electrical drive	20
	b)	Why stator voltage control is suitable for speed control of induction motors in fan and pump drives?	
	c)	Derive the equation of stopping time by plugging of an induction motor under no load as a function of slip corresponding to maximum torque and also find the minimum time for stopping	
	d)	Illustrate with neat diagram the working of a single stack variable reluctance stepper motor	
Q2	a)	What do you understand by the steady state stability. What are the main assumption? Derive the inequality constraint.	08
	b)	Illustrate with block diagram the closed loop speed control scheme for multi motor drive	06
	c)	A three phase, 440 V,50 Hz, 6 pole, Y connected induction motor has following parameters referred to the stator: $R_s = R'_r = 1\ \Omega, X_s = X'_r = 2\ \Omega$: The motor is to be braked by plugging from its initial full speed of 950 rpm. Calculate the initial braking current and torque as a ratio of their full load value	06
Q3	a)	Discuss with neat circuit diagram the operation Static Scherbius scheme. Why it is called slip energy recovery??	08
	b)	Draw the circuit diagram of switched reluctance motor and explain its working. Also derive the power equation. Draw the graph showing the variation of inductance, current and torque with θ during motoring and braking operation.	08
	c)	The temperature rise of a motor when operating for 25 min on full load is 25°C and becomes 40°C when the motor operates for another 25 min on the same load. Determine the heating time constant and steady state temperature rise.	04
Q4	a)	How does chopper fed DC separately excited DC motor operate in motoring, regenerative braking and Rheostatic braking mode. Draw circuit diagrams, speed torque relations, voltage across armature and armature current waveforms. Derive the speed torque relation.	08
	b)	Draw neat circuit diagram and waveforms and explain the working of a single phase fully controlled converter fed DC separately excited motor in continuous mode and discontinuous mode? Derive the equation of armature current Derive average voltage and speed torque relation Draw torque speed characteristic and mark the continuous and discontinuous conduction mode	08
	c)	For variable frequency control of induction motor explain the following points 1. For speed below base speed (V/f) ratio is maintained constant, why? 2. For speeds above base speed, the terminal voltage is maintained constant, why?	04

B.E (Electrical) Sem VIII – Oct 18 16/5/18

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Q5 a) Illustrate with block diagram the Direct torque control of induction motor 10

b) Illustrate the speed torque conventions and multi quadrant operation using a hoist load 10

Q6 a) Illustrate with circuit diagrams and torque speed characteristics the operation AC dynamic braking of an induction motor 10

b) What is the basic principle of vector control method? Compare scalar control with vector control 06

c) What are the reasons for using load equalization in an electrical drive 04
