Code No: RT32026 **R13** SET - 1

III B. Tech II Semester Supplementary Examinations, November/December - 2016

POWER SEMICONDUCTOR DRIVES

(Electrical and Electronics Engineering)

Time: 3 hours Maximum Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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PART –A

1	a)	What are the advantages of electric drives?	[3M]
	b)	Explain the demerits of four quadrant dc drives employing circulating current dual converter?	[4M]
	c)	Explain the advantages of chopper control of dc drives when compared to converter control of dc drives?	[4M]
	d)	Draw and explain the speed – torque characteristics of the induction motor under variable frequency control?	[4M]
	e)	List the advantages of static rotor resistance control over conventional rotor resistance control?	[3M]
	f)	What is the basic difference between true synchronous mode and self control mode for variable frequency control of synchronous motor?	[4M]

PART -B

2	a)	What are the advantages of Electric drives?	[4M]
	b)	State the essential parts of Electric drives? What are the functions of a power modulator?	[7M]
	c)	How do you define the active and passive load torques? What are the differences between the two?	[5M]
3	a)	What is a dual converter? Explain the principle of operation of a dual converter in circulating current mode. How the same is used for speed control of dc drive?	[10M]
	b)	A 220 V, 750 rpm, 200 A separately excited motor has armature and field resistances of 0.05 and 20 Ω respectively. Load torque is given by T_L = 500-0.2N N-m. Where N is the speed in rpm. Armature is fed from a three phase fully controlled rectifier with AC source voltage (line) of 200 V, 50 Hz and field is fed from a half controlled single phase rectifier with a single phase source voltage of 250 V, 50Hz. Drive operates in continuous conduction. Calculate the firing angles for speeds of 500 rpm and 1000 rpm.	[6M]
4	a)	Class-A chopper, operating in time-ratio control, is supplying the armature of the separately excited dc motor. Derive the motor speed-torque relation.	[7M]

b) A 230 V, 960 rpm and 200A separately excited dc motor has an armature resistance of 0.02Ω. The motor is fed from a chopper, which is capable of providing both motoring and braking operations. The source has a voltage of 230 V. Assuming continuous conduction: (i) Calculate the time ratio of chopper for the motoring action at rated torque and 350 rpm. (ii) Determine the maximum possible speed, if maximum value of time ratio is 0.95 and maximum permissible motor current is twice the rated value. [9M]

5 a) Explain with the help torque-speed characteristics, why stator voltage control is suitable for speed control of induction motors in fan and pump dives. Draw a neat circuit diagram for speed control of scheme of 3 phase induction motor using AC voltage controller. [7M]

b) A 440V, 3 phase, 50Hz 6 pole 945 RPM delta connected induction motor has the following parameters referred to the stator. R_s=2.0Ω, R^1_r = 2.0Ω, X_s = 3Ω, X_r = 4Ω. When driving a fan load at rated voltage, it runs at rated speed. The motor speed is controlled by stator voltage control. Determine motor terminal voltage, current and torque at 600 RPM. [9M]

6 a) Draw the circuit diagram and explain the working of a slip power recovery system using Solid - State Scherbius system for a three-phase induction motor. [8M]

b) A 3 Phase, 400V, 50 Hz, 10 KW 960 rpm, 6 pole star connected slip ring Induction motor has the following constants referred to the stator. Rs = 0.4 Ω, Rr' = 0. 6 Ω, Xs = Xr' = 1.4 Ω. The motor drives a fan load at 960 rpm. The Stator to rotor turns ratio is 2.When the motor is controlled by a static rotor resistance control, calculate the value of external resistance so that motor runs at 800 rpm for duty ratio of 0.5. [8M]

7 Describe separate controlled and self-controlled modes of operation of a synchronous motor drive in detail and compare them. [16M]

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