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

III B. Tech II Semester Supplementary Examinations, November - 2017
POWER SEMICONDUCTOR DRIVES
(Electrical and Electronics Engineering)

Time: 3 hours   Max. 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 electrical drives?	[3M]
	b)	The speed of a separately excited DC Motor is controlled by 3-ϕ full-converter. Input voltage 415V, R_a=0.9Ω, K_m=1.5V/rad/s, I_a=10A. Find the motor developed torque?	[4M]
	c)	List out the advantages offered by DC chopper drives over line commutated converter controlled DC drives.	[4M]
	d)	Draw the closed loop block diagram for automatic speed control of a three phase induction motor using solid state AC voltage controller on stator side.	[3M]
	e)	In which way a static Kramer control is different from static scherbius drive?	[4M]
	f)	Explain the operation of a open loop V/f control of multiple synchronous motor with schematic diagram.	[4M]

PART -B

2	a)	A 230V, 500 rpm, 100A separately excited dc motor has an armature resistance of 0.1 Ω .The motor is driving under rated conditions, a load whose torque is constant and independent of speed. The speeds below the rated speed are obtained with armature voltage control (with full field) and the speeds above the rated speed are obtained by field control (with rated armature voltage). (i)Calculate the motor terminal voltage when the speed is 400rpm? (ii)By what amount should flux be reduced to get a motor speed of 800 rpm?	[8M]
	b)	A 220V, 960 rpm, 90A DC separately excited motor has an armature resistance of 0.06Ω.It is coupled to an overhauling load with a torque of 300 N-m. Determine the speed at which the motor can hold the load by regenerative braking?	[5M]
	c)	What are characteristics of different types of loads? Explain.	[3M]
3	a)	A three phase DC drive is to be selected for the four quadrant operation of a large power high inertia load. Suggest a suitable drive and explain reasons for your choice.	[8M]
	b)	Explain the operation of a separately excited dc motor supplied from 1-phase fully controlled rectifier with necessary diagrams. Assume Continuous conduction.	[8M]
4	a)	Distinguish between class A and class B choppers with suitable examples of speed control of motors.	[8M]
	b)	Derive the expressions for average motor current, current I_{max} and I_{min} and average torque for chopper fed DC separately excited motor.	[8M]

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5 a) A 2.8kW, 400V, 50Hz,4-pole, 1370rpm,delta connected squirrel cage induction   [8M]
      motor has the following parameters refereed to the stator.
      $R_s=2\Omega, R_r^I=5\Omega, X_s=X_r^I=5\Omega, X_m=80\Omega$. Motor speed is controlled by stator voltage
      control. When driving a fan load it runs at rated speed at rated voltage. Calculate
      i)Motor terminal voltage, current and torque at 1200 rpm and
      ii)Motor speed, current and torque for the terminal voltage of 300V.
   b) Write some of the applications of stator voltage control of three phase induction   [4M]
      motor.
   c) What are the different methods of speed control of induction motors?   [4M]

6 a) Draw and explain a closed loop operation for a static Kramer controlled drive.   [8M]
   b) Describe using a schematic the working of a static DC link scherbius drive.   [8M]

7 a) Describe self-controlled and separate controlled mode of operation of a synchronous [8M]
      motor drive in detail and compare them.
   b) A 500KW, 3-ph, 3.3KV, 50Hz, 0.8(lag) pf, 4 pole star connected synchronous   [8M]
      motor has following parameters. Xs=15 ohm, Rs=0, rated field current is
      10A.calculate
      (i)Armature current and power factor at half the rated torque & rated field current.
      (ii)Field current to get unity power factor at the rated torque.

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