APJ ABDULKALAM TECHNOLOGICAL UNIVERSITY

08 PALAKKAD CLUSTER

Q. P. Code: PE0821141-II **(Pages: 3)**

Name: .....

Reg. No: .....

FIRST SEMESTER M.TECH. DEGREE EXAMINATION DECEMBER 2021

Branch: Electrical and Electronics Engineering **Specialization: Power Electronics**

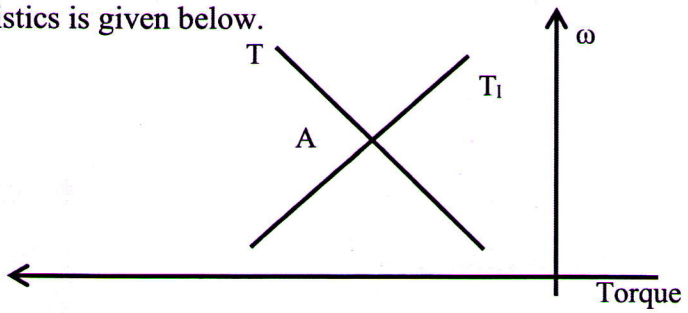
08EE6241 Electric Drives

(Common to PE)

Time: 3 hours **Max.Marks: 60**

Answer all six questions.

Modules 1 to 6: Part 'a' of each question is compulsory and answer either part 'b' or part 'c' of each question.

Q. No.	Module 1	Marks
1.a	Analyze the steady-state stability of a motor – load system whose speed torque characteristics is given below. 	3

Answer b or c

b	A motor equipped with a flywheel has to supply a load torque of 600 Nm for 10 sec followed by a no-load period long enough for the wheel to regain its full speed. It is desired to limit the motor torque to 450 Nm. Calculate the moment of inertia of the flywheel. The no load speed of the motor is 600 rpm and it has a slip of 8% at torque of 400 Nm. Assume the motor speed-torque characteristic to be a straight line in the range of operation. Motor has inertia of 10 kg-m^2.	6
c	Explain the speed torque conventions and multi quadrant operation of electric drive with a practical example.	6

Q. No.	Module 2	Marks
2.a	Quote the difference between regenerative braking and rheostatic braking.	3

Answer b or c

b	Discuss and derive the equations for energy losses during transient operation of a separately excited DC motor.	6
c	Describe about multi quadrant operation of DC separately excited motor fed from fully controlled rectifier with diagrams.	6

Q. No.	Module 3	Marks
3.a	Explain the closed loop speed control of multi-motor drives.	3

Answer b or c

b	Discuss the motoring and regenerative braking operation of chopper controlled series motor.	6
c	Discuss and develop the transfer function model of an armature controlled DC motor.	6

Q. No.	Module 4	Marks
4.a	Explain torque-slip characteristics and its various regions of an induction motor.	3

Answer b or c

b	Explain the operation of Voltage source inverter (VSI) fed induction motor drive with neat sketch.	6
c	Explain the V/F control of three phase induction motor.	6

Q. No.	Module 5	Marks
5.a	Discuss about various methods to improve the power factor.	4

Answer b or c

b	Describe rotor resistance control. Explain it with a neat circuit diagram in a three-phase induction motor.	8
c	Explain the slip power recovery scheme of an induction motor, with necessary diagrams.	8

Q. No.	Module 6	Marks
6.a	What is meant by variable frequency method of speed control in synchronous motor?	4

Answer b or c

b	A 500kW,3-phase,3.3kV,50Hz,0.8 lagging power factor,4 pole, star-connected synchronous motor has the following parameters: X_s=15Ω, R_s=0. Rated field current is 10A. Calculate i) Armature current and power factor at half of the rated torque and rated field current. ii) Field current to get unity power factor at the rated torque. iii) Torque for unity power factor operation at field current of 12.5A.	8
c	Explain the self-controlled mode of operation of a synchronous motor with necessary sketches.	8