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B.TECH
(SEM VII) THEORY EXAMINATION 2020-21
ELECTRIC DRIVES

Time: 3 Hours

Total Marks: 100

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief. 2 x 10 = 20

a.	What are the main factors which decide the choice of electrical drive for a given application?
b.	Explain the concept of steady state stability? What is the main assumption?
c.	A motor of smaller rating can be selected for a short time duty. Why?
d.	Describe relative merits and demerits of four quadrant DC drive employing non-circulating current dual converters.
e.	How the distortion factor is related to total harmonic distortion (THD)?
f.	Do you need a starter in a drive consisting of a permanent magnet motor directly connected to the battery?
g.	Describe the operation of a variable reluctance stepper motor. What is micro-stepping?
h.	Why semi-converter is preferred over full wave rectifier for motoring operation?
i.	A 220V, 970 rpm, 100 A DC separately excited motor has an armature resistance of 0.05 Ω. It is braked by plugging from an initial speed of 1000rpm. Calculate the breaking torque.
j.	Variable frequency control yields high torque to current ratio during starting. Why?

SECTION B

2. Attempt any three of the following: 10x3=30

a.	Explain the four quadrant operation of motor driving a hoist load.
b.	The temperature rise of a motor when operating for 25 min on full load is 25C and becomes 40C when the motor operates for another 25 min on the same load. Determine heating time constant and the steady state temperature rise.
c.	State and explain the important features of various braking methods of DC motor.
d.	A fully controlled rectifier is feeding a separately excited DC motor driving a friction load. Motor is operating in steady-state with a rectifier firing angle of 30°. Firing angle is now changed from 30° to 60°. Explain how the motor current and speed will change with time.
e.	When operating in regenerative braking, the induction motor slip should not be allowed to exceed the breakdown slip. Why?

SECTION C

3. Attempt any one part of the following: 10x1=10

a.	How can you define passive and active load torques? What are the differences between the two?
b.	State essential parts of electrical drives. What are the functions of a power modulator?

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4. Attempt any one part of the following: 10x1=10

a.	A motor has a continuous rating of 100 kW. The heating and cooling time constants are 50 and 70 min. respectively. The motor has a maximum efficiency at 80% full load and is employed in an intermittent periodic cycle consisting of a load period of 10 minutes followed by a no load period of 10 minutes. Calculate the value of the load in kW during the load period.
b.	Explain that the steady-state stability of a drive depends on relative characteristics of the motor and load and not just on motor (or load) characteristics.

5. Attempt any one part of the following: 10x1=10

a.	Draw and explain the speed torque characteristics for dynamic breaking operation of DC series motor. Why torque becomes zero at finite speed?
b.	A 230V, 870 rpm and 100 A separately excited DC motor has an armature resistance of 0.05Ω . It is coupled to an overhauling load with a torque of 400 N-m. Determine the speed at which motor can hold the load by regenerative breaking.

6. Attempt any one part of the following: 10x1=10

a.	Explain the motoring operation of DC motor fed by step down chopper.
b.	Explain in detail the operation of DC separately excited motor fed by 3- ϕ fully controlled rectifier considering the continuous conduction mode.

7. Attempt any one part of the following: 10x1=10

a.	What do you understand by soft start? State and explain the soft start methods employed for induction motors.
b.	In variable frequency control of a synchronous motor why (V/f) ratio is maintained constant up to the base speed and V constant above the base speed.