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10EE74

Seventh Semester B.E. Degree Examination, June/July 2019

Industrial Drives and Applications

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer any FIVE full questions, selecting at least TWO questions from each part.***
2. ***Any data missing can be assumed.***

PART – A

1 a. Explain the different parts of electrical drives system. **(10 Marks)**

b. What is quadrantal diagram? Explain the multi quadrant operation of a motor driving a hoist load. **(10 Marks)**

2 a. What is load equalization? Explain the components of load torque. **(10 Marks)**

b. What are the classes of motor duty? Explain them in brief. **(10 Marks)**

3 a. Explain the operation of 1ϕ fully controlled rectifier control of D.C. motor separately excited. **(10 Marks)**

b. A 200 V, 875 rpm separately executed d.c. motor has an armature resistance of 0.06 Ω. It is fed from a 1ϕ fully controlled rectifier with an ac voltage of 220 V, 50 Hz. Assuming continuous conduction, calculate:
i) Firing angle for rated motor torque and 750 rpm
ii) Firing angle for rated torque with (–500 rpm)
iii) Motor speed for $\alpha = 160°$ and rated torque. **(10 Marks)**

4 a. With a relevant circuit diagram and waveforms, explain the operation of chopper control of separately excited d.c. motor. **(08 Marks)**

b. A 230 V, 960 rpm and 200 A, separately excited d.c. motor has an armature resistance of 0.02 Ω. The motor is fed from a chopper which provide both motoring and braking operations. The source has a voltage of 230 V. Assuming continuous conduction.
i) Calculate duty ratio of chopper for motoring operation at rated torque and 350 rpm
ii) Calculate duty ratio of chopper for braking operation at rated torque and 350 rpm
iii) If max. duty ratio of chopper is limited to 0.95 and Max. permissibility motor current is twice the rated. Calculate max permissible field weakening and power feed to the source
iv) If motor field is also controlled. Calculate field current as a fraction of its rated filed current as a function of its rated value for a speed of 1200 rpm. **(08 Marks)**

c. Explain regeneration braking of a separately excited D.C. generator using chopper circuit. **(04 Marks)**

PART – B

5 a. What are the methods employed for braking of an Induction motor? Explain in brief Regenerative braking. **(10 Marks)**

b. A 400 V, Y connected, 3 phase, 6 pole, 50 Hz induction motor has following parameters referred to the stator $R_S = R'_r = 1\Omega$, $X_S = X'_r = 2\Omega$ for regenerative braking operation of this motor determine:
i) Maximum overhauling torque it can hold and range of speed for safe operation.
ii) Speed at which it will hold an overhauling load with a torque of 10 N-m. **(10 Marks)**

6 a. Explain the operation of synchronous machine from a fixed frequency supply. **(05 Marks)**

b. Explain the operation of braking in synchronous machines. **(05 Marks)**

c. Explain the steady-state stability limit, and dynamic stability in synchronous motors. **(10 Marks)**

7 a. Explain the operation of rotor resistance control of induction motor. **(08 Marks)**

b. A 3 phase 400 V, 6-pole, 50 Hz, Δ-connected, slip-ring induction motor has rotor resistance of 0.2 Ω and leakage reactance of 1 Ω/phase referred to stator when driving a fan load it runs at full load at 4% slip. What resistance must be inserted in the rotor circuit to obtain a speed of 850 rpm? Neglect stator impedance and magnetizing branch. Stator to rotor ratio is 2.2. **(12 Marks)**

8 a. Explain the different drives used in textile mills. **(05 Marks)**

b. Explain the different drives used in rolling mill drives. **(05 Marks)**

c. Explain the operation of self controlled synchronous motor drive employing load commutated thyristor inverter. **(10 Marks)**

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