Code No. 247

FACULTY OF ENGINEERING

B.E. 4/4 (EEE) I - Semester (Suppl.) Examination, May / June 2018

Subject: Electric Drives & static Control

Time: 3 Hours **Max. Marks: 75**

Note: Answer all questions from Par A & any five questions from Part B.

PART-A (25 Marks)

1. Draw speed-torque characteristics of dc series motor with shunted armature connection in first quadrant extending it to second and fourth quadrants. (3)
2. Explain briefly steady-state stability of equilibrium point by considering any one type of speed-torque characteristics of load torque and motor torque. (3)
3. Discuss how counter current braking is achieved in a separately excited dc motor. (3)
4. Explain why a 3-phase induction motor draws high current at the instant of dc dynamic braking? (2)
5. A 300 V, 100 A, separately excited dc motor operating at 600 rpm has an armature resistance of 0.25 Ωand controlled by a chopper with a chopping frequency of 1 kHz. Calculate the duty ratio, if the motor is running at 500 rpm and rated torque. (3)
6. A 3-phase, 50 Hz, 1440 rpm induction motor is under braking using plugging. Neglecting stator resistance and total reactance, find the impedance of the motor during braking, with respect to rated impedance. (2)
7. Draw the circuit diagram of a Type E chopper fed dc motor. (3)
8. Draw Voltage to frequency plot of 3-phase induction motor for constant torque and constant power operations from near zero frequency to greater than rated frequency. (2)
9. Mention industrial applications of Switched reluctance motor. (2)
10. Draw speed-torque characteristics of (i) 3-phase synchronous motor and (ii) BLDC motor

Part - B (50 Marks)

11. (a). Explain briefly four-quadrant operation of a drive showing directions of speed and motor & load torques with an example. (6)

    (b). Derive the condition for steady-state stability of a drive system. (4)

12. (a). Obtain an expression for accelerating time of a 3-ϕ induction motor up to its rated speed. (4)

    (b). A 440 V, 50 Hz, 4 pole, 1440 rpm, 3-ϕ star connected induction motor has the following data. Stator impedance per phase = (0.5 + j1.2) Ω. Standstill Rotor impedance per phase = (0.3 + j 1.0) Ω. Determine the initial braking torque soon after (i) plugging and (ii) dc dynamic braking. (6)

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13. (a).Draw and explain the operation of a Type B chopper fed separately excited dc motor drive with a neat circuit diagram and show input and output voltages and currents, assuming load current is continuous. (6)

    (b). A separately excited dc motor has a constant load torque of 60 Nm. The motor is driven by a 1-ϕ full-wave converter connected to a 1-ϕ, 240 V ac supply. The motor constant is 2.5 V/rad./sec.and the armature resistance is 2 Ω. Calculate the firing angle for the motor to operate at 400 rpm, assuming the armature current is continuous. (4)

14. (a). Draw and explain circulating current mode of operation a dual converter fed dc drive.
    (b). Describe inner current loop and outer speed loop operation of a separately excite dc motor with a neat block diagram. (5)

15. (a). With neat circuit diagram, explain how V/f control can be achieved using VSI fed 3-phase induction motor. (5)
    (b).What is slip-power recovery? Describe how the slip power can be recovered using a static Krammer drive. (5)

16. (a) What are the functional similarities and dissimilarities between 3-ϕ synchronous motor and BLDC motor? (5)
    (b) Explain the variable frequency control of multiple synchronous motors using a neat block diagram. (5)

17. Discuss the following. (10)
    (a) 3-phase Cyclo-converter fed 3-phase induction motor
    (b) Load inertia and load equalization

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