Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016
Industrial Drives and Applications

Time: 3 hrs.

Max. Marks: 100

Note: 1. *Answer FIVE full questions, selecting at least TWO questions from each part.*
2. *Missing data may be suitably assumed.*

PART – A

1   a.   What are the advantages of an electrical drive system? **(04 Marks)**
    b.   Explain clearly the different components of load torque, with its characteristics. **(08 Marks)**
    c.   A motor equipped with a flywheel is to supply a load torque of 1000 N-m for 10 sec followed by a light load period of 200 N-m long enough for the flywheel to regain its steady-state speed. It is desired to limit the motor torque to 700 N-m. What should be the moment of inertia of fly wheel? Motor has an inertia of 10 kg-m^2. Its no load speed is 500 rpm and the slip at a torque of 500 N-m is 5%. Assume speed-torque characteristic of motor to be a straight line in the region of interest. **(08 Marks)**

2   a.   Explain with relevant curves the following classes of motor duty:
    i)   Short time duty
    ii) Intermittent periodic duty
    iii) Intermittent period duty with starting **(06 Marks)**
    b.   Derive an expression for equivalent current for fluctuating and intermittent loadings. **(06 Marks)**
    c.   Explain with a neat diagram the four quadrant operation of a motor driving a horst load. **(08 Marks)**

3   a.   Explain with circuit diagram and relevant waveforms, a single phase fully controlled rectifier, control of a separately excited d.c. motor. **(10 Marks)**
    b.   A separately excited dc motor rated at 220 volts, 900 rpm, 160 amps has an armature resistance of 0.065 ohms fed from single phase fully controlled rectifier with an ac voltage source of 240 volts, 50 Hz. Assuming continuous conduction, calculate the firing angle for rated motor torque and 900 rpm. **(10 Marks)**

4   a.   Explain the process of motoring and regenerative braking characteristic of a chopper controlled series motor. **(04 Marks)**
    b.   Explain with a neat sketch, the dynamic braking of a separately excited dc motor. **(08 Marks)**
    c.   With a neat drive circuit of a dc motor, explain the operation of three phase fully controlled rectification control. **(08 Marks)**

PART – B

5   a.   Explain with relevant equations the operation of induction motor with unbalanced source voltage. **(08 Marks)**
    b.   Explain regenerative braking and ac dynamic braking of an induction motor. **(06 Marks)**
    c.   A 440V, 50 Hz, 4 pole, 1425 rpm induction motor has its parameters referred to stator $R_s = 0.5\ \Omega$, $R_r^1 = 0.4\ \Omega$, $X_s = X_r^1 = 1.2\ \Omega$. Motor is driving a fan load. Calculate the full load current of the motor. Take the value of $X_m = 50\ \Omega$, and induction motor is star connected. **(06 Marks)**

6   a.   Explain with block diagram variable frequency control of induction motor.   **(06 Marks)**

    b.   With a neat circuit diagram and relevant waveforms, explain the operation of voltage source inverter drive system.   **(08 Marks)**

    c.   Draw a neat circuit arrangement of static scherbius drive, explain its importance.   **(06 Marks)**

7   a.   Draw the block diagram of variable frequency control of multiple synchronous motor, and explain.   **(10 Marks)**

    b.   With a neat diagram, explain the operation of self-controlled synchronous motor drive.   **(10 Marks)**

8   Write short notes on any two along with their block diagrams:

    a.   Steel rolling mill drive system

    b.   Cement mill drives

    c.   Paper mill drive   **(20 Marks)**

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