



Eighth Semester B.E. Degree Examination, May/June 08
Industrial Drives and Application

Time: 3 hrs.

Max. Marks:100

Note : Answer any FIVE full questions.

- 1
 - a. Define natural characteristic related to dc Shunt – motor, draw natural Rheostatic speed – torque characteristic of dc shunt motor and explain. (08 Marks)
 - b. A 400V, 15 kW dc shunt motor takes 420 amps and runs at a speed of 1200 rpm. The shunt field resistance is 200 Ω . Assume that the load torque values as the square of the speed, neglect iron and friction losses and also the armature reaction effect. Calculate the resistance to be connected in series with the armature to reduce the speed to 1000 rpm, take armature resistance as 0.55 Ω . (12 Marks)

- 2
 - a. With a neat sketch, explain the method of counter current braking for a dc shunt motor, and also draw its speed – torque characteristic. (08 Marks)
 - b. A 500V, 45kW, 600 rpm dc shunt motor has full load efficiency of 90%. The field resistance is 200 Ω and the armature resistance is 0.2 Ω . The field current is maintained constant. Armature reaction and brush drop may be neglected. Calculate the rated armature current and hence find the speed under regenerative braking with no external resistance condition at which the machine develops an electromagnetic torque equal to the rated value. (12 Marks)

- 3
 - a. Explain the process of dynamic braking of a 3 phase induction motor. (08 Marks)
 - b. A 230V, 3 phase, 50Hz, 4 pole 10 amp, 0.85pf, squirrel cage induction motor has a full load rated speed of 1440 rpm. The stator losses amount to 86.16 watts. The total inertia of the motor together with load is 0.0486 kg – m². Determine
 - i) The input power
 - ii) Power transferred to rotor
 - iii) Rotor copper loss
 - iv) Permissible energy in one minute
 - v) Total energy dissipated in rotor during starting and breaking
 - vi) Total number of starts and stops, by dol stop by plugging without exceeding allowable temperature risk. (12 Marks)

- 4
 - a. Derive an expression for power rating of electric motor used in metal shearing lathes for continuous duty and constant load. (10 Marks)
 - b. Plot the load curve and select the proper motor for the following intermittent duty:
 - i) $P_1 = 35\text{kW}$ for $t_1 = 3$ sec
 - ii) $P_2 = 17\text{kW}$ for $t_2 = 20$ sec
 - iii) $P_3 = 35$ kW for $t_3 = 2\text{sec}$
 - iv) $P_4 = 13$ kW for $t_4 = 15$ sec
 Between the operating period ii) and iii) there is pause ($P = 0$) of $t_{c1} = 37$ sec, at the end of the cycle, there is another pause $t_{c2} =$ of 40 sec, take standard duty factor of 0.4. (10 Marks)

- 5 a. Explain clearly transients in separately excited dc motor with relevant equation, also draw the characteristic of dynamic response to step change in supply voltage. (10 Marks)
- b. A three – phase, 415 V, six – pole 50Hz star – connected slip – ring induction motor has a sum of stator and rotor leakage reactance referred to the stator of 1.0Ω . It is connected to a balanced 415V supply and drives a pure inertia load. The moment of inertia of the rotor including the load is $10 \text{ kg} - \text{m}^2$. The DOL starting is used and the rotor circuit resistance is adjusted so that the motor brings its load from rest to 0.95 of the synchronous speed in the shortest possible time. Calculate the minimum time to reach 0.95 of synchronous speed. (10 Marks)
- 6 a. Explain with block diagram the various stages in the reversing hot rolling mills. (08 Marks)
- b. Give the comparison between line shaft drive and sectional drive related to industrial application. (08 Marks)
- c. What are the different types of driving motors used in cement industry? Explain any one. (04 Marks)
- 7 a. Explain tractive effect with a neat sketch. (05 Marks)
- b. What are the requirements of electric traction? Draw and explain tractive effort and tractive resistance versus train speed characteristic. (10 Marks)
- c. A suburban electric train has a maximum speed of 65 kmph, the schedule speed including a station stop of 30 seconds is 43.5 km ph, find the time for actual run when the average distance between stops is 3 Km. (05 Marks)
- 8 Write notes on:
- a. Multi – motor electric drive
- b. Quadrantal diagram of N – T characteristic
- c. Co – efficient of adhesion
- d. D C Rheostatic braking for induction motor (20 Marks)
