2002 SCHEME

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EE82

Eighth Semester B.E. Degree Examination, June-July 2009
Industrial Drives & Applications

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. What is an electric drive? Mention the various types of electric drives and bring out their salient features. **(08 Marks)**

b. What is a quadrantal diagram? Explain the quadrantal diagram for hoist drive system. **(08 Marks)**

c. Distinguish between active torque and passive torque. **(04 Marks)**

2 a. Derive an expression for the ratio of full load torque to maximum torque of an inductor motor using equivalent circuit. Discuss the speed-torque characteristics. **(10 Marks)**

b. A 3-phase induction motor, at rated voltage and frequency has a maximum torque of 225% and a starting torque of 150% of full load torque. Neglect stator resistance and rotational losses and assume constant rotor resistance. Calculate i) Slip at maximum torque and ii) slip at full load. **(10 Marks)**

3 a. Explain the modified speed torque characteristics of a DC shunt motor with variation of armature current. **(08 Marks)**

b. A 400V, 15kW d.c. shunt motor takes 42A and runs at a speed of 1200rpm. The shunt field resistance is 200Ω. Assume that the load torque varies as the square of the speed. Neglect iron and friction losses. Calculate i) The resistance to be connected in series with the armature to reduce the speed to 1000 rpm ii) The voltage to be applied to the armature for 1000 rpm for speed control. **(12 Marks)**

4 a. Explain the different methods of braking in DC shunt motor. **(10 Marks)**

b. A 440V, 3ϕ, 50Hz, 10 pole squirrel cage induction motor has the following data:

Stator resistance/phase = 1.2Ω ; Stator leakage resistance/phase = 2.4Ω ;
Rotor resistance/phase = 0.006Ω ; Rotor standstill resistance/phase = 0.022Ω ;
Effective turns ratio = 10 : 1 ; Full load slip = 0.04.

The stator is star connected. The motor was operating on full load when plugging is executed. Calculate the braking torque immediately after plugging. **(10 Marks)**

5 a. Derive an expression for the equivalent load torque and equivalent moment of inertia as referred to motor shaft of a motor-load combination, where the load is fed through a gear system. **(10 Marks)**

b. A motor having a suitable control circuit develops a torque given by the relationship T_M=aw+b, where a & b are positive constants. This motor is used to drive a load torque whose torque is expressed as $T_L = cw^2 + d$, where 'c' and 'd' are some other positive constants. The total inertia of the rotating masses is J.

i) Determine the relations amongst the constants a, b, c, d.
ii) Calculate the equilibrium operating speed.
iii) Will the drive be stable at this speed.
iv) Determine initial acceleration of the drive. **(10 Marks)**

6 a. Develop an expression for the temperature rise in case of motors. Draw heating and cooling curves. **(10 Marks)**

b. On the basis of heating, select a suitable motor for the following intermittent duty:

i) $P_1 = 35$ kW for $t_1 = 3$ sec ii) $P_2 = 17$ kW for $t_2 = 20$ sec

iii) $P_3 = 35$ kW for $t_3 = 2$ sec iv) $P_4 = 13$ kW for $t_4 = 15$ sec

Between the operating periods i) & ii) above, there is a rest period of 37 sec and at the end of the cycle there is another rest period of 40 sec. Plot the load curve. **(10 Marks)**

7 a. With the help of block diagram, explain the different processes involved in paper industry. **(10 Marks)**

b. Explain clearly the driving motors used in i) Cement mill ii)Textile mill **(10 Marks)**

8 a. Explain the typical speed-time curves of electric traction system and hence discuss simplified speed time curves. Obtain an expression for maximum speed using trapezoidal speed-time curve. **(10 Marks)**

b. Define the following:

i) Coefficient of adhesion

ii) Accelerating weight

iii) Average speed. **(04 Marks)**

c. A train runs with an average speed of 40 kmph. Distance between stations is 2 km. Values of acceleration and retardation are 1.5 kmphps and 2.5kmphps respectively. Find the maximum speed of train assuming trapezoidal speed time curve. **(06 Marks)**

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