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RN-7429

B. E. - IV (Sem. VII) (IC) Examination

May / June - 2010

Industrial Drives & Controls - I

Time : 3 Hours] [Total Marks : 100

Instruction :

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ B. E. - 4 (Sem. 7) (IC)

Name of the Subject :

☛ Industrial Drives & Controls - 1

☛ Subject Code No. : 7 4 2 9 ☛ Section No. (1, 2,.....) : 1&2

Seat No. :

Student's Signature

Section I.

Q1

(a) Give answers in brief: **[10]**

i. Why are the D.C. series motors mostly used in traction machine?
ii. What are the advantages of the closed loop control of D.C. drives?
iii. What is a mechanical time constant of a D.C. drive?
iv. Which are the parameters to be varied for speed control of D.C series motors?
v. What are the different breaking modes of the D.C drive?

(b) A 220V, 960rpm, 80A separately excited dc motor has an armature resistance 0.06 ohm. Under rated conditions, the motor is driving a load whose torque is constant and independent of speed. The speeds below the rated speed are obtain with armature voltage control and the speeds above the rated speed are obtain with field control determine the motor terminal voltage when the speed is 620rpm. **[8]**

Q2

(a) Draw the block diagram of closed loop operation of D.C. motor. Also write necessary equations. Assume the motor is separately excited. **[8]**

(b) Explain three-phase full converter D.C. drive. Write necessary equations. **[8]**

OR

(a) Explain the chopper controlled D.C. motor setup with diagram. **[8]**

(b) Explain the single phase to single phase cycloconverter with R-L load. Assume the frequency is $f_o=1/4f_s$. Draw necessary waveforms. **[8]**

Q3

(a) Discuss the different methods of speed control for dc motor. (separately excited) [8]

(b) What is Dynamic breaking? Explain in detail by diagrams and mathematical expression. [8]

OR

(b) Explain the basic characteristic of dc motor with necessary diagram and equation. [8]

Section II.

Q4

(a) If the slip is 8% and the rotor speed is 1380 RPM, what is the synchronous speed of induction motor and the number of poles for 50Hz. line frequency? [2]

(b) What is scalar control? Name some scalar control methods. [2]

(c) What is base speed of an induction motor? [2]

(d) What is a switched mode power supply? [2]

(e) What are harmonics? [1]

(f) For a constant power input, if the induction motor is driven above its base speed, its torque output_____. [1]

(g) Explain the operation of class C choppers. [8]

Q5

(a) Explain the principle and operation of series inverter. [8]

(b) Draw and explain the per phase equivalent circuit model of induction motor. [8]

OR

(a) Explain the PWM technique in inverters and state its advantages. [8]

(b) Draw and explain the torque-speed characteristics of an induction motor. [8]

Q6

(a) A three phase 460V 60 Hz four pole qye connected induction motor has the following equivalent circuit parameters: R_s=0.42 Ω, R_r=0.23 Ω, X_s= X_r =0.82 Ω and X_m=22 Ω. The no-load loss, which is 60W, may be assumed constant. The rotor speed is 1750 RPM. Use the approximate equivalent circuit to determine (a) Synchronous speed ω_s; (b) the slip s; (c) input power P_i; (d) the developed torque T_d; (e) efficiency. [8]

(b) Write short note (any two): [8]

1. Design of components in parallel inverter.
2. Step up chopper.
3. Jones chopper.