Reg. No. : | | | | | | | | | | |

Question Paper Code: 52253

M.E. DEGREE EXAMINATION, JUNE 2016

Second Semester

Power Electronics and Drives

15PPE203 – AC DRIVES AND CONTROL

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. In a motor circuit, static frequency changers are used for

   (a) Power factor improvement (b) Improved cooling
   (c) Reversal of direction (d) Speed regulation

2. If the output voltage frequency of a CSI is *f Hz*, then input frequency is

   (a) 3f (b) 2f (c) f (d) f/2

3. The efficiency by using rotor resistance control in Induction motor is

   (a) High (b) Very High (c) Low (d) Very Low

4. The injected emf in the rotor of induction motor must have

   (a) Zero frequency
   (b) the same frequency as the slip frequency
   (c) the same phase as the rotor emf
   (d) high value for the satisfactory speed control

5. How many thyristors are required to construct a load commutated inverter for a synchronous motor drive?

   (a) 1 (b) 2 (c) 4 (d) 6

PART B - (5 x 3 = 15 Marks)

6. What are the features of variable frequency control?

7. What are the disadvantages of square wave inverter in induction motor drive?

8. Compare slip power recovery scheme with rotor resistance control.

9. What is the principle of vector control?

10. Differentiate between brushed and brushless excitation of synchronous motor drive.

PART C - (5 x 16 = 80 Marks)

11. (a) Starting from the approximate equivalent circuit, derive an expression for the torque-speed characteristics, based on this expression. How does this characteristics change (i) when stator voltage is varied (keeping frequency constant) (ii) when the rotor resistance is varied? (16)

Or

(b) A 3ϕ, star connected, 50 *Hz*, 4 pole induction motor has the following parameters in ohms per phase referred to the stator. $Rs = Rr' = 0.034\ \Omega$ and $Xs = Xr' = 0.18\ \Omega$. The motor is connected by the variable frequency control with a constant (V/f). Determine the following for an operating frequency of 15 *Hz.* (i) The breakdown torque as a ratio of its value at the rated frequency for motoring and braking (ii) The starting torque and rotor current in terms of their values at the rated frequency. (16)

12. (a) Discuss in brief about the control of an induction motor by stator voltage variation using 3 phase voltage controller. (16)

Or

(b) With neat circuit diagram explain the voltage source inverter Fed inductor motor drive. Explain the PWM control and its advantages. (16)

13. (a) Show that the no load speed of the induction motor in the Kramer drive can be varied from near standstill to full speed as the firing angle α is varied from almost 180 degrees to 90 degrees. (16)

Or

(b) Explain using a diagram, the working of a static scherbuis system. Show that it can operate in the synchronous, sub synchronous and super synchronous ranges. Bring out its advantages. (16)

14. (a) With the help of a block diagram and flow chart, explain the implementation of an indirect vector control scheme for an induction motor. (16)

Or

(b) Explain the direct torque control of Induction machines and derive the torque expression with stator and rotor fluxes. (16)

15. (a) Draw the equivalent circuit and discuss the performance of wound field cylindrical rotor motor with necessary performance equations when fed from a voltage source. (16)

Or

(b) Explain the operation of a 'power factor control' based self –controlled synchronous motor drive. (16)

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