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M.E. DEGREE EXAMINATIONS: JUNE 2015

(Regulation 2014)

Second Semester

POWER ELECTRONICS AND DRIVES

P14PET202 : Solid State AC Drives

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The cycloconverter fed synchronous motor are mainly used for _____ application   [K3]

     a) High speed and high power   b) High speed and low power

     c) Low speed and low power   d) Low speed and high power

2. Synchronous motor fed from load commutated inverter has   [K2]

     a) Lower cost   b) Lower losses

     c) Lower power   d) Lower cost and Lower losses

3. The synchronous motor fed from a voltage source inverter requires only   [K3]

     a) Forced commutation   b) Natural Commutation

     c) Load commutation   d) Line Commutation

4. Match List-I (Drive) with List-II (Speed control range) and select the correct answer using the codes given below the lists: [K3]

List I	List II
A. Square wave inverter-fed induction motor	i. 1. 50% of synchronous speed to synchronous speed 2. 4. 5.
B. PWM inverter-fed induction motor	ii. 10% of base speed to beyond base speed (1: 20)
C. Slip energy recovery scheme with cycloconverter in the rotor circuit	iii. 3. o to 1/3 base speed
D. Cycloconverter-fed induction motor	iv. 67% of synchronous speed to 133% of synchronous speed

     a) A-2 B-1 C-4 D-3   b) A-4 B-1 C-3 D-4

     c) A-3 B-2 C-4 D-1   d) A-3 B-2 C-1 D-4

5. A three phase ac voltage controller feeding a three phase induction motor has an output of [K₁]
   a) Constant voltage of variable frequency   b) Variable voltage of variable frequency
   c) Voltage of Constant frequency   d) Constant voltage of Constant frequency

6. A CSI fed IM is inherently unstable when it operates on [K₂]
   a) Open loop   b) Closed loop
   c) A variable frequency supply keeping   d) A variable frequency supply keeping
      air gap flux constant   stator flux constant

7. Assertion (A) :Three-phase transformers of different vector groups should not be operated [K₄]
   in parallel

   Reason (R) : Transformers belong to different vector groups will not have the same phase
   sequence on the secondary side.
   a) Both A and R are true and R is the   b) Both A and R are true but R is not a
      correct explanation of A   correct explanation of A
   c) A is true but R is false   d) A is false but R is true

8. Variable speed drives are [K₁]
   a) Constant speed drives   b) Constant torque drives
   c) Constant power drives   d) Open loop drive

9. In motor circuit static frequency changers are used for [K₃]
   a) power factor improvement   b) improved cooling
   c) reversal of direction   d) speed regulation

10. In the consideration which is not involved in the selection of the type of electric drive for a [K₃]
    particular application depends on
    a) Speed control range and its nature   b) Starting torque
    c) Environmental conditions   d) Voltage Sag

PART B (10 x 2 = 20 Marks)

11. Mention the different methods of stator side speed control of induction motor drive. [K₂]

12. Draw the equivalent circuit of induction motor. [K₂]

13. Define slip of induction motor. [K₁]

14. How is PWM inverter supplied in VSI fed synchronous motor? [K₃]

15. What is the need for constant $\dfrac{V}{f}$ ratio in variable voltage induction motor drives? [K₄]

16. Give the advantages of vector control method. [K₂]

17. What is field weakening control? [K₁]

18. Give the concept of direct and indirect feedback control. [K₁]

19. When can the synchronous motor be load commutated? [K₂]

20. What are the advantages of load commutation over forced commutation? [K₂]

PART C (6 x 5 = 30 Marks)

21. Bring out the advantages and disadvantages of Slip power recovery scheme. [K₂]

22. Is it possible to operate the induction machine as a generator? What is the polarity of slip in that mode of operation? [K₂]

23. Compare VSI fed induction motor drive with CSI fed drive. [K₄]

24. Briefly explain the concept of dc drive analogy of induction motor. [K₂]

25. Differentiate scalar and vector control methods. [K₅]

26. Illustrate the concept of brushless excitation system in synchronous motor. [K₃]

PART D (4 x 10 = 40 Marks)

27. Draw the per phase equivalent (approximate) circuit of induction motor referred to stator and also give the final torque expression. [K₄]

28. With neat diagram, explain the need for soft start control of induction machine. [K₂]

29. Derive expressions to obtain torque with stator flux component for induction motor. [K₄]

30. Illustrate the closed loop speed control of load commutated inverter synchronous motor drive. [K₃]

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