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Register Number:……….……

M.E DEGREE EXAMINATIONS: MAY 2018

(Regulation 2015)

Second Semester

POWER ELECTRONICS AND DRIVES

P15PET202 : Solid State AC Drives

COURSE OUTCOMES

CO1: Describe the components of drives for AC motors

CO2: Present the control methodologies of AC drives

CO3: Choose an AC drive and apply the speed control methodology for an application

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

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Assertion (A): The rotor slots of a three -phase induction motor are skewed.   CO1   [K_1]

   Reason (R): It reduces the locking tendency of the rotor.

   a) Both A and R are Individually true and R is the correct explanation of A   b) Both A and R are Individually true but R is not the correct explanation of A

   c) A is true but r is false   d) A is false but R is true

2. Which of the following statements about a vector control of AC motor are true?   CO2   [K_1]

   a. Complex mathematical model

   b. Poor dynamic response

   c. Low power dissipation

   d. Precise control of AC motors

   a) a, b, c   b) a, c, d

   c) a only   d) c, d

3. In direct field oriented control the field angle is directly calculated by using…..   CO2   [K_1]

   a) Terminal voltages   b) Hall sensors

   c) Current   d) All the above

4. Match List-I with List-II about an induction motor   CO3   [K$_2$]

List I	List II
a. If rotor speed, N=Ns	i. fans, pumps, blowers
b. If rotor speed, N>Ns	ii. cranes, elevators, hoists
c. Squirrel Cage induction motor	iii. Motor acts as a generator
d. Slip ring induction motor	iv. Motor stops to rotate

	a	b	c	d
a)	iii	ii	i	iv
b)	iv	iii	ii	i
c)	iv	ii	iii	i
d)	iv	iii	i	ii

5. Assertion (A): The synchronous motor is used as a synchronous capacitor for power   CO1   [K$_1$] factor improvement.

Reason (R): The synchronous motor will act as a synchronous condenser when it is over excited under no load condition.

a) Both A and R are Individually true and R is the correct explanation of A

b) Both A and R are Individually true but R is not the correct explanation of A

c) A is true but R is false

d) A is false but R is true

6. The damping winding in a synchronous motor is generally used…….   CO1   [K$_1$]

a) to provide starting torque only

b) to reduce noise level

c) to reduce eddy currents

d) to prevent hunting and provide the starting torque

7. Which of the following statements about a three-phase squirrel-cage induction motor   CO1   [K$_1$] are false?

     a. It has no external electrical connections to its rotor

     b. A three-phase supply is connected to its stator

     c. A magnetic flux which alternates is produced

     d. It is cheap, robust and requires little or no skilled maintenance

     e. It is a self-starting motor

a) a, b, c only

b) c and d only

c) c only

d) b, e only

8. The concept of V/f control of inverters driving induction motors results in………   CO3 [K$_2$]

   a) constant torque operation   b) speed reversal

   c) reduced magnetic loss   d) harmonic elimination

9. In case the field of a synchronous motor is under excited, the power factor will be…...   CO1 [K$_2$]

   a) leading   b) lagging

   c) Zero   d) unity

10. A 4-pole three-phase induction motor has a synchronous speed of 50, 25, 15 rev/s. The   CO3 [K$_2$]
    correct sequence of supply frequency to the stator is:

    (i) 50Hz ; (ii)100Hz ; (iii) 30Hz

    a) ii-i-iii   b) i-ii-iii

    c) iii-ii-i   d) i-iii-ii

PART B (10 x 2 = 20 Marks)

11.	What is rotating magnetic field?	CO1	[K$_1$]
12.	Is it possible to include/ Exclude external resistance in the rotor of a Squirrel cage induction motor? Justify.	CO1	[K$_1$]
13.	What is cogging and crawling?	CO3	[K$_1$]
14.	Why the speed control of three phase induction motor with constant supply voltage and reduced supply frequency is not preferred?	CO3	[K$_2$]
15.	How the dynamic braking is obtained in three phase induction motor?	CO3	[K$_1$]
16.	Draw the equivalent circuit model for three phase induction motor.	CO1	[K$_1$]
17.	What is meant by constant torque operation of an electric motor?	CO3	[K$_2$]
18.	What is meant by vector control?	CO2	[K$_1$]
19.	What are the features of brushless excitation?	CO1	[K$_1$]
20.	Write the effects of Hunting in synchronous motor.	CO1	[K$_2$]

PART C (6 x 5 = 30 Marks)

21.	Explain the V/f control schemes for induction motors.	CO3	[K$_1$]
22.	Explain the closed loop control of three phase induction motor with AC voltage controller.	CO3	[K$_1$]
23.	Write short notes on cascade control of induction motor.	CO3	[K$_1$]
24.	Derive the torque expression with stator and rotor fluxes.	CO2	[K$_2$]
25.	List the various speed control methods of synchronous motor. Discuss about any one methods.	CO3	[K$_1$]
26.	Discuss the flux vector estimation of induction motor by voltage model.	CO2	[K$_2$]

Answer any FOUR Questions
PART D (4 x 10 = 40 Marks)

27. Explain the different slip power recovery schemes for induction motor control   CO3   [K$_1$]

28. (i) A three phase, 6 pole, 50Hz induction motor is fully loaded with a slip of 3%.   (8)   CO3   [K$_2$]
     Find the value of resistance/phase required in the rotor circuit, to reduce the
     speed by 10%.Assume rotor resistance/phase is 0.2Ω.
     (ii) Draw the Speed-Torque characteristics of an Induction motor with various   (2)
     values of Rotor Resistance.

29. Describe the Direct Torque Control strategy of induction machines in detail.   CO2   [K$_2$]

30. Describe the Direct and Indirect method of field oriented control of induction   CO2   [K$_2$]
     machines in detail.

31. (i) Describe the operation of load commutated inverter fed synchronous motor   (8)   CO3   [K$_1$]
     drive and also discuss the merits and demerits of the same.
     (ii) Draw the Torque-Torque Angle Curve.   (2)   CO3   [K$_1$]

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