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Total Number of Pages: 02

**M.Tech**  
**PEPC202**

**2<sup>nd</sup> Semester Regular/Back Examination 2015-16**

**ELECTRIC DRIVES-II**

**Q.CODE:W768**

**Time: 3 Hours**

**Max Marks: 70**

**Answer Question No.1 which is compulsory and any five from the rest.**  
**The figures in the right hand margin indicate marks.**

- Q1** Answer the following questions: **(2 x 10)**
- a) Derive the torque equation of three phase Induction motor in terms of flux linkages?
  - b) Draw the torque speed characteristic of a 3-phase Induction motor and show the plugging and regenerative region.
  - c) Write the voltage equation of the 3-phase synchronous motor in rotor rotating reference frame.
  - d) What do you understand by direct vector control?
  - e) What is the advantage of current model over voltage model in direct vector control of Induction motor?
  - f) Write the characteristic of Alnico used as Permanent Magnet.
  - g) What are the advantages of sensor less vector control?
  - h) Draw the torque speed characteristic of 3-phase Induction motor drive with variable stator current.
  - i) What are the advantages and disadvantage of stator flux oriented vector control over rotor flux oriented vector control?
  - j) Draw the torque versus time curve of a 3-phase Induction motor considering the transient region.
- Q2** a) What do you understand by reference frame for modeling of Electrical Machines? **(5)**  
b) Derive the torque equation for the separately excited DC Motor using Kron's Primitive Model. **(5)**
- Q3** a) Derive the impedance matrix of a 3-Phase Induction Motor in rotor rotating reference frame. **(3)**  
b) Draw the  $d^e-q^e$  equivalent circuit for the 3-phase Induction motor in rotor rotating reference frame. **(7)**
- Q4** (a) Why feed-forward decoupling signal injection in stator flux-oriented vector control is necessary. **(3)**  
(b) Derive the expression for decoupling current in stator flux oriented vector control. **(7)**
- Q5** a) What do you understand by indirect vector control? **(3)**  
b) Derive the expression for slip speed used for indirect vector control of Induction Motor drive. **(7)**
- Q6** a) With a constant V/f ratio, motor develop a constant maximum torque, except at low speed. Justify. **(5)**  
b) Write any five different types of Permanent Magnet materials available. And draw their B-H characteristic curve. **(5)**

**Q7 a)** What do you understand by direct torque control of 3-phase induction motor? Briefly explain with the help of phasor diagram. **(7)**

**b)** Explain the control strategy and switching table, for direct torque control of 3-phase Induction motor. **(3)**

**Q8** Write short notes on any two: **(5 x 2)**

**a)** Effect of harmonics in Induction motor drive.

**b)** Rotor Flux estimation using current model.

**c)** CSI fed synchronous motor drive.

**d)**  $d^e$ - $q^e$  modeling of synchronous motor in rotor rotating reference frame.