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M.Tech(PT)
ICPC202

2nd Semester Back Examination 2016-17
ADVANCED ELECTRIC DRIVES
BRANCH: IPCD (PT)
Time: 3 Hours
Max Marks: 70
Q.CODE: Z1243

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) Give an example of a mechanical load with (i) zero speed and rated torque (ii) positive load torque with negative speed.
 - b) Derive the torque equation for a 3-phase Induction Motor from the Kron's primitive model?
 - c) Draw the phasor diagram of salient pole Synchronous machine in motoring mode.
 - d) Write the expression for the flux linkages in terms of currents for the equivalent two phase machine of 3-phase Induction Motor.
 - e) Draw the complex qds equivalent circuit of three phase Induction motor in steady state.
 - f) Draw the dynamic q^c equivalent circuit of a three phase Induction Motor.
 - g) What are the characteristic of Cobalt-Samarium used as Permanent Magnet?
 - h) Write the merits and drawbacks of stator flux oriented vector control over direct vector control ac motor drives.
 - i) What is the advantage of current model over voltage model in direct vector control of three phase Induction motor?
 - j) Vector control of induction motor is used to decouple torque and flux component of armature current. Justify.
- Q2** a) The three phases Induction motor is represented by any rotor rotating reference frame w_b . Write the **(5+5)**
- (a) Voltage equation for stator and rotor windings.
 - (b) Flux equation for stator and rotor windings.
- Q3** a) How does the vector control is different from the scalar control of Induction Motor Drive? **(3)**
- b) Draw the block diagram for stator flux oriented vector controlled drive for 3-phase Induction Motor. **(7)**
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- 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) Explain direct vector control of three phase Induction Motor using Voltage Model. **(5)**
b) Derive the expression for slip speed used for indirect vector control of Induction Motor **(5)**
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- Q6** a) Draw the block diagram for Indirect vector control of a 3-phase Induction Motor Drive. **(7)**
b) Write any two different types of Permanent Magnet available, and also draw their B-H characteristic curve. **(3)**
- Q7** a) Derive the torque expression used for the direct torque control of induction motor drive in terms of stator and rotor flux. **(7)**
b) Explain the control strategy and switching table, for direct torque control of 3-phase Induction Motor drive. **(3)**
- Q8** Write short notes on any two: **(5 x 2)**
a) Flux estimation using current model.
b) Switch Reluctance Motor Drive.
c) Induction motor characteristic in constant torque and field weakening region.
d) Direct Vector Control of 3-phase Induction explanation using phasor diagram.