

GUJARAT TECHNOLOGICAL UNIVERSITY**M.E. SEMESTER I (old course)–EXAMINATION (Remedial) – WINTER 2015****Subject code: 714504N****Date: 15/12/2015****Subject Name: Modeling & Analysis of Electric Machine****Time: 10:30 AM to 1:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Derive voltage and torque equation of salient pole synchronous machine in phase variable. **07**
- (b) Explain starting operation of shunt connected DC machine supplied from a constant voltage source. **07**
- Q.2** (a) For a singly excited magnetic system, derive the relation for the magnetic stored energy in terms of reluctance. **07**
- (b) Derive voltage equation to represent two magnetically coupled circuits with leakage. Assume magnetic system to be linear. Draw equivalent T circuit with coil 1 as reference coil. **07**
- OR**
- (b) Explain the significance of Park's transformation in the analysis of synchronous machines. **07**
- Q.3** (a) Explain the computer simulation of three phase symmetrical induction machine in balanced stator and rotor condition in arbitrary reference frame. **07**
- (b) If A is one reference and B another, show that $({}^A K^B)^{-1} = {}^B K^A$. **07**
- OR**
- Q.3** (a) Derive the voltage equations referred to stator winding of 3 phase, 2 pole, Y-connected symmetrical squirrel cage induction motor into machine variables. **07**
- (b) Prepare time domain block diagram pertaining to DC series motor. **07**
- Q.4** (a) Write the voltage equations in the capacitive and resistive elements together. Determine the voltages in qd0 frame and hence obtain the impedance matrix into qd0 frame. **07**
- (b) Explain generalized theory of rotating electrical machine and Kron's primitive machine. **07**
- OR**
- Q.4** (a) Develop equivalent circuit of a synchronous machine in the arbitrary reference frame. **07**
- (b) Obtain the expression of torque in terms of flux linkages and d-q currents for Synchronous rotating reference frame. **07**
- Q.5** (a) Explain the mathematical model of switch reluctance motor. **07**
- (b) Derive the torque speed characteristics of Brushless DC Machine and define common mode of operation. **07**
- OR**
- Q.5** (a) Derive voltage and torque equation of Brushless DC Machine in machine variables and in rotor reference frame variables. **07**
- (b) Explain the computer simulation of three phase synchronous machine into rotor reference frame using suitable block diagram. **07**
