

**B.Tech. IN ELECTRICAL ENGINEERING
(BTELVI)**

Term-End Examination

June, 2013

**BIEE-016 : ELECTRO-MECHANICAL ENERGY
CONVERSION-III**

Time : 3 hours

Maximum Marks : 70

*Note : Answer **any seven** questions and each question carries equal marks.*

1. Outline the various steps of applying the generalized theory to the various rotating electrical machines. Also, list the various limitations of the generalized theory of electrical machine. 10

2. Fig.1 shows the schematic diagram of a separately excited. Servo motor carrying a mechanical load of inertia 'J' on its shaft. Derive the transfer function $\omega_r(s)/V_t(s)$ where $\omega_r(s)$ is the Laplace transform of the shaft speed and $V_t(s)$ is the Laplace transform of armature voltage. 10

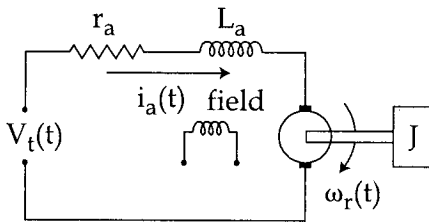


Fig. 1

3. Explain how park's transformations transform equations in a, b, c variables to d, q, o variables. 10
4. Derive the equivalent circuit of a double cage poly-phase induction motor with the help of its generalized mathematical model. 10
5. Sketch a typical torque-speed characteristic of a poly-phase induction motor under rated voltage and frequency conditions. On the same diagram, sketch how this torque speed characteristic gets modified with the following changes : 10
- (a) With rated supply frequency,
 - (i) Supply voltage is decreased
 - (ii) Supply voltage is increased
 - (b) With rated supply voltage
 - (i) Supply frequency is decreased
 - (ii) Supply frequency is increased
6. Derive the equivalent circuit of a single-phase induction motor with the help of double revolving field theory. 10
7. A single phase, 4 pole, induction motor takes a line current of $60 \angle -70^\circ$ A at standstill with its main winding excited from 230V, 50 Hz source. Neglecting stator impedance, magnetizing current and rotational loss, compute the torque at a slip of 5%. 10

8. Explain, with neat diagrams, how it is possible to obtain the speeds both below and above synchronous speed in scherage motor ? 10
9. (a) State the difference between a stepper motor and conventional motor. 5
- (b) Explain the construction and working principle of Reductance motor. 5
- 10 Write short notes on *any two* of the following : $2 \times 5 = 10$
- (a) Power angle characteristics of synchronous machine.
- (b) Hysteresis motor.
- (c) Burshless DC motor.
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