Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER–IV • EXAMINATION – SUMMER • 2014**

**Subject Code: 142401** **Date: 16-06-2014**

**Subject Name: Electro Mechanical Energy Conversion - I**

**Time: 10:30 am - 01:00 pm** **Total Marks: 70**

**Instructions:**

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

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|---|---|---|---|
| **Q.1** | **(a)** | Explain the theory of production of rotating field with three-phase supply in three-phase induction motor. | **07** |
| | **(b)** | Define slip. Explain the relation between torque and slip. Explain the effect of change in supply voltage on torque and speed in three-phase induction motor. | **07** |
| **Q.2** | **(a)** | A shunt generator has a full load current of 196 A at 220 V. The stray losses are 720 W and the shunt field coil resistance is 55 Ω. If it has a full load efficiency of 88%, find the armature resistance. Also find the load current corresponding to the maximum efficiency. | **07** |
| | **(b)** | Explain the characteristics of separately excited dc generator. | **07** |
| | | **OR** | |
| | **(b)** | State the working principle of dc generator. Derive the equation of generator emf. | **07** |
| **Q.3** | **(a)** | With the help of neat sketch explain the three point starter. | **07** |
| | **(b)** | A 220 V dc series motor is running at a speed of 800 r.p.m. and draws 100 A. Calculate the speed of the motor when developing half the torque. Total resistance of the armature and field is 0.1 Ω. Assume that the magnetic circuit is un saturated. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | Explain the Ward-Leonard system for speed control of dc shunt motor. | **07** |
| | **(b)** | A 250 V dc shunt motor has a shunt field resistance of 250 Ω and an armature resistance of 0.25 Ω. For a given load torque and no additional resistance included in the shunt field circuit, the motor runs at 1500 r.p.m. drawing an armature current of 20 A. If a resistance of 250 Ω is inserted in series with the field, the load torque remaining the same, find out the new speed and armature current. Assume the magnetization curve to be linear. | **07** |
| **Q.4** | **(a)** | Explain the short circuit test of single-phase transformer in detail. | **07** |
| | **(b)** | Draw the vector diagram of transformer at different loads considering the effect of resistance and leakage reactance. | **07** |
| | | **OR** | |
| **Q.4** | **(a)** | Explain the theory of an auto transformer. | **07** |
| | **(b)** | Explain the equivalent circuit of single-phase transformer. | **07** |
| **Q.5** | **(a)** | Define voltage regulation of an alternator. Explain the synchronous impedance method for determining the regulation of an alternator. | **07** |
| | **(b)** | Explain the construction and working of Schrage motor with neat diagram. | **07** |
| | | **OR** | |
| **Q.5** | **(a)** | Define Distribution factor and Pitch factor. Derive the emf equation of an alternator. | **07** |
| | **(b)** | Explain the repulsion principle with the help of neat diagram. | **07** |

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