

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-III EXAMINATION – SUMMER 2016

Subject Code:130904

Date:13/06/2016

Subject Name:Electrical Machines-1

Time:10:30 AM to 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.

- Q.1** (a) Explain the working principle and construction of a DC machine. **07**
(b) Draw and derive the equivalent circuit of a 1- Φ transformer. **07**
- Q.2** (a) What are different losses occurring in a DC motor. Explain the power stages of a DC motor. **07**
(b) Define slip. Derive the relation for starting torque and running torque for an Induction motor. **07**
- OR**
- (b) Explain OC and SC test of a single transformer with a neat diagram. Also explain how efficiency of a transformer for a given load can be found with the help of these tests. **07**
- Q.3** (a) Derive the EMF equation for an alternator. Also explain distribution factor and pitch factor. **07**
(b) State the conditions necessary for parallel operation of two 1- Φ transformer. **07**
- OR**
- Q.3** (a) Classify different types of DC generator. Draw and explain the Load characteristics of each type of DC generator. **07**
(b) State the different methods used for speed control of DC motor. Explain Ward Leonard method in detail. **07**
- Q.4** (a) Explain the torque–slip characteristics of a 3- Φ induction motor. Also derive the relation for maximum torque. **07**
(b) With a neat diagram explain the working of a 3-point starter. **07**
- OR**
- Q.4** (a) Explain the voltage build up process of a DC shunt generator and critical field resistance. **07**
(b) Calculate the flux per pole required on a 55-kW, 400-V, 8-pole, 600 r.p.m DC shunt generator with 256 conductors arranged in a lap-connected winding. The armature resistance is 0.15Ω , the shunt field resistance is 200Ω and the total brush contact drop is 2-V on full-load. **07**
- Q.5** (a) Explain with a neat diagram parallel operation of two alternator and conditions necessary for parallel operation. **07**
(b) Derive the relation for copper saving in an auto-transformer compared to 2-winding transformer. Also state the applications of an auto transformer. **07**
- OR**
- Q.5** (a) Explain voltage regulation for an alternator. State the different indirect methods to find voltage regulation of an alternator. Explain any one in detail. **07**

- (b) A 5-kVA, 220/440-V, 50Hz, single phase transformer gave the following test results:
O.C. Test: 220-V , 2-A, 100-W on L.V.side
S.C. Test : 40-V 11.4A, 200-W on H.V.side .

07

Find (i) the percentage efficiency at half load, 0.9 p.f. lagging
(ii) the regulation at full load, 0.9 p.f. lagging.
