

GUJARAT TECHNOLOGICAL UNIVERSITY**B.E. Sem-III Remedial Examination May 2011****Subject code: 130904****Subject Name: Electrical Machine - 1****Date: 28-05-2011****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.

- Q.1** (a) Derive the emf equation of lap connected d.c generator. **07**
(b) Derive the expression for the torque developed in the d.c motor. **03**
Explain the construction and working of three point starter for d.c
(c) motor. **04**

- Q.2** (a) Explain the internal and external characteristic of d.c shunt generator. **07**
(b) A 440 V, 4-pole, lap connected shunt motor has a no-load input current of 15 A and a shunt field current of 10A. At full load it takes a current of 150A. if armature resistance is 0.1 Ohm, flux per pole on no load is 0.05 weber, number of armature conductors are 750 and contact drop per brush is 1V. Determine the No-load speed and Full-load speed of the motor if the magnetic flux is weakened by 1.5% on full load. **07**

OR

- (b) A 500 V, 250 kW, long shunt compound generator induces an e.m.f of 480 V when running at 1000 r.p.m on no load. On full load the speed of the machine drops to 975 r.p.m, the flux increases by 15 % and terminal voltages rises to 500V. If the series and shunt field resistances are 0.02 Ohm and 100 Ohm respectively, calculate the armature resistance of the generator. Assume a voltage drop of 1 V per brush. **07**

- Q.3** (a) Explain the Swinburne's test to find the efficiency of d.c motor. **07**
(b) A 3- Ph, 50 Hz, 4-pole Induction motor has a slip of 4%. Determine the frequency of rotor e.m.f and speed of motor. **07**
If rotor has a resistance of 1 Ohm and standstill reactance of 4 Ohm, Calculate the power factor of motor (i) at standstill, and (ii) at a speed of 1400 r.p.m.

OR

- Q.3** (a) Define the term "slip" of induction motor. Draw and explain the torque-slip characteristic of a three phase induction motor. **07**
(b) Explain the construction & working principle of induction motor. Also compare squirrel cage induction motor and slip ring induction motor. **07**

- Q.4** (a) Explain the operation of transformer on load with vector diagram. **07**

- (b) 5 kVA, 220/440 V, 50 Hz, single phase transformer gave the following test results: 07

O.C Test : 220 V, 2 A, 100 W on L.V side.

S.C.Test : 40 V, 11.4 A, 200 W on H.V side.

Determine :

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

OR

- Q.4** (a) Explain the direct load test for determination of voltage regulation and efficiency of transformer with necessary diagram. 07

- (b) The efficiency of a 200 kVA, 1-ph, Transformer is 98.75 % when delivering full load at 0.8 power factor and 99 % on 80 % of full load at 0.9 power factor. Calculate the iron losses and copper losses of transformer at full load. 07

- Q.5** (a) Define ‘pitch factor’ and ‘distribution factor’ of an alternator. Also derive the e.m.f equation of an alternator. 07

- (b) Define “All day efficiency” of transformer. Explain the construction and working principle of Autotransformer. 07

OR

- Q.5** (a) Explain the Synchronous impedance method to find out the voltage regulation of an alternator. 07

- (b) Explain the speed control methods of d.c.shunt motor. 07
