Reg. No.									

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

III SEMESTER B.TECH. ELECTRICAL & ELECTRONICS ENGINEERING

END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: ELECTRICAL MACHINERY-I [ELE 2103]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: November 30, 2016 (9 am to 12 noon)** **Max. Marks: 50**

Instructions to Candidates:

- Answer **ALL** questions.
- Missing data may be suitably assumed.
- Graph sheets will be supplied, if required.

1A. Sketch the phasor diagram of a transformer connected to a leading power factor load. Assume transformer ratio is 1. ***(03)***

1B. A 4 kVA, 200/400 V, 50 Hz, single-phase transformer gave the following test figures:

No load (OC)(LV side) : 200 V, 0.7 A, 70 W

Short circuit (SC)(HV side) : 15 V, 10 A, 80 W

Sketch its equivalent circuit referred to the LV side. Also, find its efficiency and secondary terminal voltage on full load at unity power factor. ***(07)***

2A. A 100 kVA, 11.5/2.3 kV, 50 Hz, two-winding transformer is connected as an auto-transformer with voltage ratios (a) 13.8/11.5 kV and (b) 13.8/ 2.3 kV. Estimate its kVA rating and copper saving in both cases. ***(04)***

2B. Two single-phase transformers operate in parallel to supply a load of (44+j18.6) Ω. The transformer-A has a secondary emf of 600 V on open-circuit and an internal impedance of (1.8+j5.6) Ω referred to its secondary side. The corresponding figures for transformer-B are 610 V and (1.8+j7.4) Ω respectively. Calculate the terminal voltage, power delivered to the load and power shared by each of the transformers. ***(06)***

3A. Why induction motors are recommended to start with reduced voltages? Sketch & explain the working of a star-delta starter. ***(04)***

3B. A three-phase, 190 V, 60 Hz, 4 pole induction motor has star connected stator windings. The per phase rotor resistance is 0.1 Ω and its per phase standstill reactance is 0.9 Ω. The ratio of the stator to rotor turns is 1.75. Full load slip is 4 %. Calculate the mechanical power generated and the load torque. Also, find the maximum torque and the corresponding speed. ***(06)***

4A. A three-phase 400 V, 50 Hz, 4 pole delta connected induction motor gave following test results:

No load : 400 V 2.8 A 200 W

Blocked rotor: 90 V 7.5 A 550 W

Draw a circle diagram and determine: efficiency of operation, mechanical output, torque and slip when the motor draws a current of 6.9 A. Given: Stator & rotor resistances are equal. ***(06)***

4B. Using double field revolving theory, explain the torque-slip characteristics of a single-phase induction motor. ***(04)***

5A. Sketch and explain the internal & external load characteristics of a DC shunt generator. How the load characteristics can be improved? ***(04)***

5B. With the help of flux waveforms, explain the armature reaction in DC machines. What are its effects? ***(06)***