Reg. No.									

Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)

IV SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, MAY 2016

SUBJECT: ELECTRICAL MACHINERY-II [ELE 2202]

REVISED CREDIT SYSTEM

Time: 3 Hours 10 MAY 2016 MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data if any may be suitably assumed.
- Use of Non programmable scientific calculator is permitted.

1A. A 220 V DC shunt motor draws a line current of 34 A when running at 1,200 rpm. The armature and shunt field resistances are 0.5 Ω and 55 Ω respectively. It is desired to increase the speed to 1,500 rpm with same line current drawn from the supply. Calculate the value of external series resistance required to be connected in the field circuit. Assume linear magnetization characteristics. ***(04)***

1B. With a neat connection diagram, explain ***Hopkinson's test***.

The Hopkinson's test conducted on two identical DC machines gave the following results for full load.

Line voltage = 250 V, Line current excluding field currents = 15 A, Motor armature current = 75 A, Field currents = 2 A and 2.5 A. Calculate the efficiency of the motor if the armature resistance of each machine is 0.2 Ω. ***(06)***

2A. With a neat connection diagram, explain the working of a three-point starter. Also explain the protective schemes employed in it. ***(04)***

2B. A 6.6 kV, 3 phase, 50Hz, star connected alternator gave the following data for open circuit and short circuit tests. If the per phase effective armature resistance is 0.2Ω, determine the voltage regulation at full load current of 500A at 0.75 pf lagging by MMF method.

Open circuit line voltage (kV)	3.1	4.9	6.6	7.5	8.2
Field current (A)	3.2	5.0	7.5	10.0	14.0
Shot circuit current (A)	500	--	1170	--	--

(06)

3A. Two station generators A and B operate in parallel. Frequency drop of A is 0.025 Hz/MW and that of B is 0.07Hz/MW. If no load frequency of both A and B is 50Hz, calculate the common operating frequency and load sharing for a connected load of 65MW. ***(04)***

3B. A turbo alternator with synchronizing reactance of 10Ω, is delivering 200A at upf to an infinite bus at a voltage of 11kV. If the prime mover input is kept constant & excitation is increased by 20%, find the new current and power factor. Keeping the excitation at the increased level, find the maximum power output of the alternator and the corresponding current and power factor. ***(06)***

4A. Explain Blondel's two reaction theory for Salient Pole Alternator. Derive the circuit model and sketch the phasor diagram showing the relationship between terminal voltage and internal voltage. ***(05)***

4B. A 5 MVA, 6.6 kV, 3- phase, 50 Hz, star connected salient pole alternator with per phase direct and quadrature axes reactances of 12 Ω and 10 Ω respectively is connected to an infinite bus. When the generator is operating at its rated MVA and power factor of 0.9 lagging, calculate the excitation emf required, synchronizing power per electrical degree of displacement. ***(05)***

5A. A 15 kW, 400 V, 50 Hz, 3 phase, star connected synchronous motor has its synchronous impedance of (1+j5) Ω per phase. If the excitation is maintained constant at 277 V per phase, determine the maximum load the synchronous motor can drive and corresponding current and power factor. ***(05)***

5B. Explain the phenomenon of hunting in synchronous motors.

Find the natural frequency of oscillations of a 500 kVA, 11 kV, 1500 rpm, 50 Hz, non-salient pole alternator with synchronous reactance of 12Ω. The alternator is operating at full load 0.8 p.f lag. Consider the moment of inertia of the rotating part equal to 50 x 10^3 kg-m^2. ***(05)***