Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

MAKE-UP EXAMINATIONS, JUNE 2019

ELECTRICAL MACHINERY – II [ELE 2202]

REVISED CREDIT SYSTEM

Time: 3 Hours **13 JUNE 2019** **Max. Marks: 50**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.
- Graph sheet may be provided.

1A. Hopkinson's test was conducted on two identical DC machines. It gave the following results for full load:

Line voltage is 220 V, field currents of motor & generator are 0.3 A & 0.45 A. Armature currents of motor & generator are 25 A & 19.5A, respectively. Calculate the efficiency of the generator if the armature resistance of each machine is 0.45 Ω. ***(04)***

1B. DC series motors are never used in applications where the load may be thrown off. Why? Substantiate your answer with the help of suitable characteristics. ***(03)***

1C. What is the necessity of starter in DC motors? With a neat schematic diagram, explain the construction of three point starter. ***(03)***

2A A 250 V DC shunt motor takes a line current of 44 A at full load and runs at a speed of 1000 rpm. The resistances of the armature circuit and field circuit are 0.3 Ω and 125 Ω respectively. Calculate the value of additional resistance to be inserted in series with the armature circuit to run the motor at

(a) 800 rpm at rated torque.
(b) 700 rpm at half the rated torque. ***(04)***

2B. Explain how regenerative braking can be achieved in DC motors. ***(03)***

2C. A 3-phase, star connected alternator is rated 1,600 kVA, 13.5 kV. Its per-phase effective armature resistance & synchronous reactance are 1 & 40 respectively.
a) Calculate the percentage voltage regulation for a load of 1,250 kW at 0.8 pf lagging.
b) Draw the phasor diagram for the given load. ***(03)***

3A. A 3-phase, 50 Hz, 1000 rpm, star connected alternator has 72 armature slots with 6 conductors per slot and the coil span is 10 slots. The average airgap flux per pole is 0.26Wb. Calculate the distribution and pitch factors of the winding, number of turns per phase and line value of emf induced. ***(05)***

3B. Explain the effect of load power factor on armature reaction in alternators. ***(03)***

3C. Explain the conditions for synchronization of an incoming 3-phase alternator with live bus bars. ***(02)***

4A. Draw and explain the phasor diagram of salient pole alternator based on Blondel's two reaction theory. ***(05)***

4B. A 1000 kW, 3.3 kV, 24 pole, 50Hz, 3-phase star connected synchronous motor has synchronous reactance of 3.4 Ω per phase and the resistance is negligible. The motor is fed from infinite bus bar at 3.3kV. Its field excitation is adjusted to result in upf operation at rated load. Compute the maximum power and torque that the motor can deliver with its excitation remains constant at this value. ***(05)***

5A. What is meant by reluctance power in salient pole synchronous machines? Discuss with power-angle characteristics. ***(03)***

5B. Draw and explain the significance of V curve in synchronous motors. ***(03)***

5C. Two station alternators A & B operate in parallel. Respective rated capacities are 50 MW and 25 MW. The no-load frequency of both generators is 50 Hz. The drooping characteristics are 0.06 Hz/MW and 0.07 Hz/MW respectively. Calculate:

(a) The common operating frequency & load sharing for a connected load of 50 MW.

(b) Maximum power shared by both machines without overloading either of them. ***(04)***