Reg. No.									

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent institution of MAHE, Manipal)

IV SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING)

END SEMESTER EXAMINATIONS, APRIL 2018

SUBJECT: ELECTRICAL MACHINERY-II [ELE 2202]

REVISED CREDIT SYSTEM

Time: 2.00 PM – 5.00 PM **Date: 23 April 2018** **Max. Marks: 50**

Instructions to Candidates:

- Answer **ALL** the questions.
- Use of non-programmable scientific calculator is permitted.
- Graph sheet will be provided.

1A. A 4 pole, 240 V DC shunt motor operates at 1,000 rpm and delivers 15 hp for an armature current of 50 A and for a field current of 1 A. The armature winding is lap connected with 540 conductors. If armature resistance is 0.1 Ω and total brush drop is 2 V; determine (a) shaft torque (b) flux / pole (c) efficiency at the given load, and (d) the friction & windage losses. ***(06)***

1B. With neat diagrams, explain the construction, schematic and operation of BLDC Motor. ***(04)***

2A. Sketch and explain a 3 point starter for DC shunt motor. Design the 3 resistor sections for a 25 kW, 230 V DC shunt motor with armature resistance of 0.12 Ω. The maximum current during starting is to be restricted to 1.5 times the full load current. ***(05)***

2B. The Hopkinson's test on two DC shunt machines gave the following results for full load. Line voltage 250 V, Line current 45 A excluding field currents, motor armature current 385 A, field currents of 5 A and 4 A. Calculate the efficiency of each machine. The armature resistance of each machine is 0.015 Ω. ***(05)***

3A. A 3 phase, 10 pole, star connected alternator runs at 600 rpm. It has 120 stator slots with 8 conductors per slot. The conductors of each phase are connected in series. If the winding is short chorded by two slots, determine the r.m.s value of phase and line electromotive forces if the flux per pole is 56 mWb. ***(04)***

3B. The open circuit and short circuit test readings for a 3 phase, star connected 1,000 kVA, 2,000 V, 50 Hz synchronous generator are:

Field current (A)	10	20	30	40	50	60
OC voltage (L-L) (V)	800	1,500	2,000	2,350	2,600	2,750
SC current (A)	-	200	300	-	-	-

The effective armature resistance is 0.15 Ω per phase. Determine the full load percentage regulation at 0.8 p.f. lagging by MMF method. ***(06)***

4A. With a neat diagram, explain an experimental procedure to determine the X_d and X_q of a salient pole alternator. ***(04)***

4B. A 10 MVA, 11 kV, 3 phase, 50 Hz, 2 pole, star connected alternator operates in parallel with other synchronous generators. Its synchronous reactance is 1.2 Ω per phase. The armature resistance may be neglected. At full load, 0.8 lagging power factor,

a) Determine the excitation emf.
b) If the excitation is suddenly increased by 10 % without changing the load, determine the synchronizing power and torque per mechanical degree of phase displacement. ***(06)***

5A. The excitation of a 415 V, 3 phase star connected synchronous motor is such that the induced e.m.f is 520 V. The impedance per phase is 0.5 + j4 Ω. The friction and iron losses are constant at 1,000 W. Calculate the horse power output, line current and efficiency for

a) Maximum power output
b) Maximum power input ***(06)***

5B. What is hunting in synchronous motor? How is it mitigated? ***(04)***