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MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH. (ELECTRICAL & ELECTRONICS ENGINEERING)

MAKEUP EXAMINATIONS – JUNE 2018

SUBJECT: ELECTRICAL MACHINERY-II [ELE 2202]

REVISED CREDIT SYSTEM

Time: 2.00 PM – 5.00 PM **Date: 19 June 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. No-load test conducted on a self-excited DC shunt machine of 5 kW, 220V, 1,500 rpm, gave the following results:

Input voltage and current : 220 V, 1.5 A

Motor armature resistance : 0.8 Ω

Motor shunt field resistance : 350 Ω

Predetermine the full-load efficiency when the machine is run as a

(i) Motor

(ii) Generator

(06)

1B. What is the need of a starter for a DC motor? With a neat schematic diagram of a 3-point starter, explain its working. What are the protection schemes employed in it?

(04)

2A. A 220 V DC shunt motor drives a mechanical load whose torque varies as the square of the speed. The motor draws 48 A when running at 960 rpm. Determine the value of resistance to be inserted in series with the armature circuit in order to reduce the speed by 25 %. Take armature & field resistances as 0.1 Ω & 100 Ω respectively. Assume linear magnetization characteristic. ***(06)***

2B. Write a technical note on BLDC motors.

(04)

3A. For a synchronous generator, derive suitable expressions for

(i) Pitch factor

(ii) Distribution factor ***(04)***

3B. The O.C. and S.C. tests conducted on a 1,200 kVA, 2,200 V, 50 Hz, 3-phase, star connected alternator gave the following data:

Field current (A)	10	20	30	40	50
OC voltage (V/phase)	850	1,600	2,200	2,450	2,600
SC current (A)	--	220	330	--	--

The effective armature resistance is 0.25 Ω/ phase. Plot the OCC & SCC and find the voltage regulation at full-load, 0.8 pf lagging using EMF method. ***(06)***

4A. With neat sketch, explain how an alternator can be synchronized to the grid using 'Bright lamp method'. What are the conditions to be met to synchronize two 3-phase alternators? ***(05)***

4B. Two identical 3-phase star-connected generators having synchronous impedance of (2 + j40) Ω /phase supplying equal power, operate in parallel. They supply a total load of 1,000 kW at 6,000 V and at 0.8 power factor lagging. The field of the first generator is so excited that its armature current is 55 A lagging. Find

(i) The open circuit e.m.f of each machine

(ii) The armature current and power factor of the other machine. ***(05)***

5A. Based on Blondel's two reaction theory, develop the phasor diagram of a salient pole synchronous generator. ***(04)***

5B. An industrial load of 200 kW is supplied at 11 kV, the power factor being 0.8 lagging. A synchronous motor is used to meet an additional load of 50 kW and at the same time, it is used to raise the overall power factor to 0.9 lagging. Find the kVA capacity of synchronous motor and the power factor at which it operates. ***(06)***