



Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)



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IV SEMESTER B.TECH (ELECTRICAL & ELECTRONICS ENGINEERING) MAKEUP EXAMINATIONS, JULY 2016

SUBJECT: ELECTRICAL MACHINERY-II [ELE-2202]

REVISED CREDIT SYSTEM

Time: 3 Hours

02 JULY2016

MAX.MARKS: 50

Instructions to Candidates

- ✤ Answer ALL the questions.
- Use of Non programmable scientific calculators is permitted.
- ✤ Graph sheet wil be provided on request.
- **1A.** Design a 4-step starter for a 240V, 50A, 1500 rpm DC shunt motor having an armature resistance of 0.2Ω . The maximum armature current during starting is 1.4 times the full load armature current.
- **1B.** A 250 V DC shunt motor has an armature resistance of 0.5 Ω and a field resistance of 250 Ω . When driving a constant torque load at 600 rpm, the motor draws 21 A. What will be the new speed of the motor if an additional 200 Ω resistance is inserted in the field circuit?
- **2A.** How the efficiency of DC series machines is determined using *Field's Test*?
- **2B.** A three phase, 50 Hz, 1000 rpm, star connected alternator has an airgap area of 314 cm² per pole. The armature winding has a phase spread of 60 degrees and is accommodated in 4 slots per pole per phase with 6 conductors per slot. The coils are short pitched with a span of 165 degrees. The flux density distribution is given by $B_{max} = 0.9 \sin \theta + 0.35 \sin 3\theta$. Determine,
 - (a) Winding factors for fundamental and third harmonic components.
 - (b) Induced e.m.f per phase.
- **3A.** A 6.6 kV, 3 phase, 50Hz, star connected alternator gave the following data for open circuit test.

Field current (A)	1.6	3.2	5	7.5	10	14
Open circuit phase voltage (kV)	0.9	1.8	2.8	3.8	4.4	4.8

A field current of 6 A circulates full load current of 500 A. Theper phase effective armature resistance is 0.5Ω . Determine the voltage regulation at full load current at 0.8 pf lagging by EMF method.

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3B.	With neat diagram explain the working priciple of <i>Synchroscope</i> . Also explain how Synchroscope is used to synchronise two alternators?				
4A.	A 10 kVA, 3 phase, 400 V, 50 Hz, star connected salient pole alternator has direct and quadrature axes reactance of 5 Ω and 2 Ω respectively. When it is delivering full load at 0.8 p.f lag to an infinite bus, determine the electromagnetic power and reluctance power.	5 M			
4B.	Explain the different methods employed to start synchronous motor.	5 M			
5A.	A 3.3 kV, 3 phase, 50 Hz, 4 pole star connected synchronous motor has a synchronous impedance of 0.2 + j 3 Ω per phase. For an input current of 200A at 0.9 p.f lag, determine the maximum gross power and torque developed.	5 M			
5B.	A factory has an average load of 250 kW at a power factor of 0.7 lagging. In addition, a synchronous motor with an efficiency of 88 % supplies a mechanical load of 60 kW. Determine the kVA rating and power factor of synchronous motor if it is used to raise the combined power factor to 0.9 lag.	5 M			