



COLLEGE OF ENGINEERING & TECHNOLOGY

Department: Electrical & Computer Control Engineering

Lecturer: Prof. Dr. Adel Metaweh

Course: Electrical Machines

Course Code: EE 329 T

Date: 25 / 05 / 2015

Marks: 40

Time: 2 hours

Final Examination Paper

Answer the following questions:

- 1) a – Draw the relation between the torque and current in D.C. series motor and shunt motor.
– Draw the relation between the speed and current in D.C. series motor and shunt motor.

b – A D.C 250 V shunt motor has an armature circuit resistance of 0.2Ω and a field resistance of 100Ω . When running at 800 rpm, the motor takes 20 A from the supply. Find the new speed if the total torque was increased by 40% while a field rheostat of 25Ω was inserted in the field circuit. Assume that the magnetic flux is directly proportional to the field current over the given operating range.

(10Marks)

- 2) a – Explain how a cycloconverter is used to control the speed of A.C. motors in electric propulsion systems on ships.

b – A 100 HP, three phase star connected, 230 V, 50 Hz, six pole induction motor operating at rated conditions has an efficiency of 91%, and draws a line current of 248 A. The core losses, stator copper loss and rotor copper loss are 1697 W, 2803 W and 1549 W respectively. Determine the following:

- Power input
- Total losses
- Air gap power
- Shaft speed
- Power factor
- Friction and windage loss
- Shaft torque

(10Marks)

- 3) a – Derive an equation for maximum power generated from an A.C. synchronous generator.

b – A three phase 460 V, two pole, 60 Hz star connected synchronous alternator with a synchronous reactance of 1.26 ohm/phase is connected to an infinite bus. The power angle when supplying 112 KW to the bus is 25° , Neglecting losses. Determine:

- (i) Turbine torque supplied to alternator.
- (ii) E.M.F generated in the armature.
- (iii) Active and reactive components of apparent power and P.F.
- (iv) Turbine speed.

(10Marks)

Members of Course Examination Committee:	Signature:	Date:
Lecturer: Prof. Dr. Adel Metaweh		17/5/2015
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