COLLEGE OF ENGINEERING & TECHNOLOGY

Department: Electrical & Control Engineering

Lecturers : Staff

Course : Electrical Machines — Starting Time: 14:00

Course Code: EE 329 — Marks: 40

Date : 01 / 06 / 2015 — Time: 2 hours

Final Examamination Paper

Answer the following questions:

1.a. Can you operate a series excited dc motor at no-load (without being coupled to a mechanical load)? Give reason for your answer.

1.b. Would you select a dc series excited motor or a dc shunt excited motor to drive a high torque load? Give reason for your answer.

1.c A 400 V, 4 kW, 900 rpm, 4 poles, lap wound, 600 conductors, dc separately excited generator has an armature circuit resistance of 0.5 Ω. Find the following:

(i) The induced voltage in the armature "E" at full load.

(ii) The flux per pole "ϕ".

(10 Marks)

2.a. Draw on the same graph the relation between the voltage of a synchronous alternator and the load current when the load is:

(i) Resistance (ii) Inductance (iii) Capacitance

2.b. A 20 kVA, 480 V, 50 Hz alternator has an armature resistance of 0.2 Ω and a reactance of 1.02 Ω. Find the following when the alternator is delivering full load current at 0.8 lagging power factor.

- The induced EMF "E".
- The power (torque) angle "δ".
- The voltage regulation
- Sketch a phasor diagram

(10 Marks)

Members of course Examination Committee:	Signature of Members of course Examination Committee:	Date:
Lecturer: Prof. Ahmed Lotfy		5/1/2015
Course Coordinator : Dr. Ahmed Kadry		17/1/2015
Head of Department: Prof. Hamdy Ashour		17/1/2015

3.a. State what is the effect of inserting resistances in the rotor's circuit of a slip ring type induction motor, use torque / slip characteristic curves to illustrate your answer.

3.b. A three phase, 460 V, 60 Hz, four pole induction motor draws a full load line current of 18.88 A at 0.833 power factor. The stator core losses, stator copper loss, rotor copper loss and rotational losses are 240 W, 685 W, 260 W and 860 W respectively. Determine the following:

(i) Air gap power. (ii) Shaft speed
(iii) Shaft (output) torque (iv) Efficiency

(10 Marks)

4. A 15 kVA, 2300 V / 230 V step-down transformer has the following test data with test voltages applied to primary winding:

	Applied Voltage (V)	Measured current (A)	Measured power (W)
Open circuit test	2300	0.21	50
Short circuit test	51.08	6.521	189

Find the following when the transformer is supplying full-load (rated) current to 0.8 lagging power factor load at 230 V:

- The actual primary (supply) voltage and current
- The transformer's efficiency

(10 Marks)

Good Luck

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