



COLLEGE OF ENGINEERING & TECHNOLOGY

Department: Electrical & Control Engineering

Lecturer: Prof. Dr. Adel Metaweh

Course: Electrical Machines

Course Code: EE 329 T

Date: 14/01/2015

Marks: 40

Time: 2 hours

Final Examination Paper

Answer **ALL** questions:

- 1) a – Draw the circuits of the different types of self excited D.C. generators.
b – A 2-pole series motor runs at 707 r.p.m. when taking 100 A at 85 V and with the field coils in series. The resistance of each field coil is 0.03Ω and that of the armature is 0.04Ω . If the field coils are connected in parallel and load torque remains constant, find (a) speed (b) the additional resistance to be inserted in series with the motor to restore the speed to 707 r.p.m. (10 Marks)
- 2) a – Derive an equation for the maximum power developed from of a synchronous generator.
b – A 9 KVA, 208 V, 1200 r.p.m., three phase, 60 Hz, Y connected alternator has a field winding of 4.5Ω . The armature winding impedance is $0.3+j5 \Omega/\text{phase}$. When the generator operates at its full load and 0.8 pf lagging, the field current is 5 A. The rotational loss is 500 W. Determine (a) the voltage regulation (b) the efficiency (c) the torque applied by the prime mover. (10 Marks)
- 3) a – Draw the circuit diagram of the transformer when referred to (i) primary side (ii) secondary side.
b – A 250/500 transformer gave the following test results:
S.C. test: $I_{sc} = 24 \text{ A}$, $V_{sc} = 10 \text{ V}$ and $W_{sc} = 100 \text{ W}$
O.C. test: $I_o = 1 \text{ A}$, $V_a = 250 \text{ V}$ and $W_o = 80 \text{ W}$
Determine the equivalent circuit parameters and calculate applied voltage and efficiency when the output is 10 A at 500 V and 0.8 power factor lagging. (10 Marks)
- 4) a – Explain the theory of operation of the 3 phase induction motor.
b – A 6-pole, 50 Hz, 3-phase induction motor running on full load with 4% slip, develops a torque of 149.3 N.m. The friction and windage losses are 200 W and the stator copper losses and iron losses equal 1620 W. Calculate (a) the h.p output (b) the rotor copper loss (c) the efficiency at full load. (10 Marks)

Best wishes.

Members of Course Examination Committee:	Signature:	Date:
Lecturer: Prof. Dr. Adel Metaweh		5/1/2015
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