



COLLEGE OF ENGINEERING & TECHNOLOGY

Department : Electrical & Control Engineering

Lecturer : Dr. Rania Assem

Course : Electrical Machines 2

Course Code : EE 322 Ni

Marks : 40

Date : 28/5/2014

Time : 2 hour

Final Exam

Answer all the following questions

Q1 [5 marks] (A-4)

a) Indicate whether the following statements are true or false AND correct the false statement

1. Step up transformers cannot be used as step down transformers ()
2. In shell type transformers, the two windings are wound on the same leg ()
3. High permeability silicon steel is used in the construction of the transformer windings ()
4. For non-ideal transformers, the terminal voltages ratio is equal to the turns ratio ()
5. For DC transformers, the leakage flux of a coil does not interfere with the other one ()
6. Copper losses is reduced by laminating the transformer core ()
7. The self-reactance of a transformer winding is less than its leakage one ()
8. The transformers' efficiency is in the range of 50% more or less ()
9. The transformer maximum efficiency occurs when copper loss is double the core loss ()
10. The current at the maximum efficiency of a transformer is greater than its rated ()

b) "An induction motor is a rotary transformer".

Comment on the following sentences indicating the similarities and differences between transformers and induction motors in terms of construction and theory of operation.

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Q2 [10 marks] (B-11)

A test data for a 208V, 60Hz, Y connected IM rated at 1710rpm is as follows

No load test	450W	1.562A	208V
Locked rotor test	59.4W	2.77A	27V

Calculate the IM parameters referred to the stator side.

Q3 [10 marks] (B-11)

Three phase 208 volt, 60Hz, 8 pole, star-connected, induction motor has negligible stator impedance of $0.02 + j0.08 \Omega$ /phase at standstill (machine speed is zero). Determine:

- (a) Slip at maximum torque
- (b) Maximum torque
- (c) Starting torque
- (d) For a constant load of $0.55T_{max}$ is applied, deduce if the machine will run or fails.

Q4 [10 marks] (C-11)

Compare between the following:

- (i) AC voltage controller
- (ii) voltage/frequency control
- (iii) Y/ Δ starter

From the following points of view

- (1) theory of operation, (2) starting torque, (3) maximum torque and (4) losses

Also, draw the TORQUE-SLIP characteristics for each control technique

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