



# COLLEGE OF ENGINEERING & TECHNOLOGY

Department : Electrical & Control Engineering

Lecturer : Professor Yasser Gaber A. Dessouky

Course : Special Electric Machines

Course Code: EE 521

Time : 14.00-16.00

Date : 28 / 5 / 2016

Marks: 40

## ANSWER ALL QUESTIONS

- Q1: a- Explain the relationship between the synchronous speed and the rotor speed for the induction machine in case of i) generator operation mode, ii) motor operation mode.
- b- 3-phase induction generator whose data is given below is connected to a grid of 3.3 KV (RMS Line) and 50 Hz. The generator is running at 1550 rpm. Calculate the active and reactive power and the efficiency of this generator.  
Stator resistance = 4 ohm, Rotor resistance referred to stator = 4 ohm  
Stator reactance = 20 ohm, Rotor reactance referred to stator at stand still = 20 ohm  
No. of poles = 4 Poles, core losses and mechanical losses are 20 kW. **(ILO: B11) (10 marks)**
- Q2: a- Explain two starting methods for the single-phase induction motor.
- b- A single-phase induction motor connected to a 110 V, 50 Hz utility supply. The motor is running at 1475 rpm. Calculate the developed torque and the efficiency of this motor.  
Stator resistance = 4 ohm, Rotor resistance referred to stator = 4 ohm  
Stator reactance = 8 ohm, Rotor reactance referred to stator at stand still = 8 ohm  
Magnetization reactance = 800 ohm and the Magnetization resistance = 4000 ohm  
No. of poles = 4 Poles, mechanical losses are 35 watt. **(ILO: A4) (10 marks)**
- Q3: a- Explain the theory of operation of the single-phase synchronous reluctance motor from the energy conversion point of view as a doubly excited electro-mechanical system.
- b- A DC series motor whose field current is 2 A DC value. If the maximum value of the mutual inductance between the armature and field coil is 0.4 H. Find an expression of the developed torque and calculate the average torque. **(ILO:D6) (10 marks)**
- Q4: a- Show how the switched reluctance motor, can develop electromechanical torque, providing your answer with sketches for the control and construction circuit of a single phase SRM.
- b- For a single phase SRM, the command current equals to 4 A while the aligned and the unaligned inductances are 180 mH and 30 mH respectively (consider co-sinusoidal wave form for the inductance profile. Calculate the developed torque out of this motor. Sketch the current, inductance and torque wave forms as a function of the rotor position. **(ILO: C20) (10 marks)**

Name	Signature	Date
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Course coordinator: Dr Ahmed Kadry		
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