



# COLLEGE OF ENGINEERING & TECHNOLOGY

Department : Electrical & Control Engineering

Lecturer : Professor Yasser Gaber Dessouky

Course : Special Electric Machines

Course Code: EE 521

Time : 11.30-13.30

Date : 20 / 1 / 2016

Marks: 40

## ANSWER ALL QUESTIONS

- Q1: a- Explain why the 3ph standalone induction generator is connected to capacitor banks.
- b. Explain how to connect the IG to the three phase grid (parallel operation or synchronization).
- c- 3-phase induction generator whose data is given below is connected to a grid of 11KV (RMS Line Value) and 50 Hz. The generator is run at 1600 rpm. Calculate the active and reactive power and the efficiency of this generator.  
Stator resistance = 5 ohm, Rotor resistance referred to stator = 5 ohm  
Stator reactance = 25 ohm, Rotor reactance referred to stator at stand still = 25 ohm  
No. of poles = 4 Poles, core losses and mechanical losses are 30 kW. (ILO: A4) (10 marks)
- Q2: a- Explain the theory of operation of the single phase induction motor.
- b- Single phase induction motor whose is connected to a 220 V, 50 Hz utility supply. The motor is run at 1450 rpm. Calculate the developed torque and the efficiency of this motor.  
Stator resistance = 5 ohm, Rotor resistance referred to stator = 5 ohm  
Stator reactance = 10 ohm, Rotor reactance referred to stator at stand still = 10 ohm  
Magnetization resistance = 1000 ohm and the Magnetization reactance = 5000 ohm  
No. of poles = 4 Poles, mechanical losses are 50 watt. (ILO: B11) (10 marks)
- Q3: a- Explain the theory of operation of the DC motor from the energy conversion point of view as a doubly excited electro-mechanical system.
- b- A single phase 2-pole synchronous reluctance motor whose is fed from an AC supply whose frequency is 50 Hz such that the current has a RMS value of 5 A and a load angle of ( $\delta$ ). The aligned (d-axis) and the unaligned (q-axis) inductances are 100 mH and 50 mH respectively. Find an expression of the developed torque and calculate the average torque for a load angle of (4) degrees. (ILO: C20) (10 marks)
- Q4: a- Explain the theory of operation of the switched reluctance motor, showing the control and construction circuit of a single phase SRM.
- b- For a single phase SRM, the command current equals to 5 A while the aligned and the unaligned inductances are 200 mH and 20 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: D6) (10 marks)

Name	Signature	Date
Lecturer: Professor Yasser Gaber Dessouky		3/1/2016
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