

Menoufia University  
Faculty of Engineering  
Dept. of Electrical Engineering.  
Date: 27 /5/2017  
Total Marks: 100



Final Term Exam  
Academic Year: 2016-2017  
Post graduate Students (Ph.D)  
Allowed Time: 3 Hours

التحكم الرقمي في الآلات الكهربائية

Subject/Code: **Digital Control of Electrical Machines / ELE 717**

This exam measures ILO's no. (A1, A3, A5, B1, B2, B3, C3, C4)

Remarks: No. of pages: 1 No. of questions: 6

Allowed Tables and Charts: (None)

**Answer All The Following Questions:**

**Question 1**

**[25 Mark]**

- Explain the IGBT characteristics. What are the modes of operation when implemented in highly inductive H-bridge inverter?
- Show with drawing how to use the IGBT for the following power electronics application ( Three Phase Inverter, Three level Active Rectifier, Active Filter)
- Direct Torque Control is one of the control methods of induction motor. Is the DTC control self-starting without any speed encoder? Draw block diagram of DTC; state some of its benefits.

**Question 2**

**[25 Mark]**

- Describe the sinusoidal PWM for single phase H-Bridge.
- What is Over modulation? is it preferable in high power application?
- Why we should introduce dead switching time? Roughly give a value.
- Why DTC control generates more harmonics?

**Question 3**

**[25 Mark]**

- Give a brief description about hysteresis band (HB) modulation
- How can you use fixed switching pattern to mitigate lower order harmonics. What is the name of this modulation technique
- How do you determine or select the switching frequency for a PWM converter in a drive system?

**Question 4**

**[25 Mark]**

- Explain the principle of V/F control of induction motor. Can this method used to drive parallel connected motors?
- Explain the closed loop slip control V/F method.
- Can you implement fuzzy control with a look-up table in DSP?
- After simulating a power electronic system with Simulink, can you use the controller part of the simulation program for real-time control with DSP?