


<p>Menoufia University Faculty of Engineering, Shebin El-Kom Electrical Engineering Dep. Semester 2, 2013-2014 Exam Date : 3 / 6 / 2014</p>		<p>Code: ELE 425A Subject: Control of Electrical Machines Time Allowed : 3 hours Total Marks : 70 marks Year: 4th Year</p>
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Important: This exam measures ILO's no. (a4, a13, b15,c15,d1)
Remarks: No. of pages: 2 No. of questions: 4
Allowed Tables and Charts: (None)

Answer all the following Questions [70 Marks]

Question (1) [15 Marks]

- (a) Mention the different types of sensors which are used in control systems. (5 Marks)
- (b) What are the of power factor correction? (5 Marks)
- (c) Explain with the help of diagrams, the different types of converters. (5 Marks)

Question (2) [15 Marks]

- (a) Drive the dynamic equations of a separately dc motor with armature voltage control. Write these equations in a state-space form. Draw the block diagram for such a control system. (7 Marks)
- (b) Three different types of error processing are commonly used in control systems, P, I and D, named after three basic ways of manipulating the error information. Compare the action and features of these types. (8 Marks)

Question (3) [20 Marks]

- (a) A separately excited dc motor fed from a three phase six pulse fully controlled bridge converter develops a full load torque at 1300 rpm when the firing angle is zero. The armature takes a current of 55 A from a 400 V supply having a resistance of 0.7 Ω . Determine the voltage of ac system and range of delay angles for speed control from rated speed to 500 rpm, at constant rated torque being delivered by the motor. (10 Marks)
- (b) Explain with the help of phasor diagrams, the basic concept of how i_{ds} and i_{qs} can be established as control vectors in the direct vector control method. (10 Marks)

Question (4)

[20 Marks]

(a) State the main difference between the scalar and vector control methods. Explain with the help of block diagrams how the scalar control can be employed to control the induction motor. (10 Marks)

(b) Describe with the help of block diagrams how the rotor flux can be used to calculate the unit vectors from air gap flux and stator currents of an induction motor (in the stationary reference frame) . Write down the various transformations, which used in such a control system. (10 Marks)

Good luck