



COLLEGE OF ENGINEERING & TECHNOLOGY

Department : Electrical & Control Engineering

Lecturer : Dr. Mostafa Abdel-Geliel

Course : Microcontroller applications

Course Code: EE 416

Time : 2 hours

Date : 2 / 6 / 2015

Marks: 40

Final Exam

(Q1) (6 marks)

- (a) Explain the analog input features of ATmega16 microcontroller and its associated registers. (3 marks)
- (b) Discuss the mode of operation of ATmega16 microcontroller Timer. (3 marks)

(Q2) (6 marks)

- (a) If an ATmega 16 microcontroller operates at 8 MHz find the minimum and maximum baud rate for USART. If it is required to send a data with the communication parameter of 9200 bit/s, asynchronous communication, odd parity, 2 stop, and 7 bit data.
- Represent the waveform of the signal if the transmitted data is 28.
 - Define the name of each associated registers (UDR, UBRRH, UBSRH, UCSRA, UCSRB and UCSRC).
 - Draw the flow chart and write the program code.

Q2) (6 marks)

A digital control system has the following specifications:

1. 8 channels, 10 bit, uni-polar ADC with a 5 v reference and a 20 μ s conversion time and S/H with a 10 μ s acquisition time

If this system is used to control a pressure system with a sensor has sensitivity 10 mv/kpa in the range of 100 to 400 Kpa. It is required to

- 1- Find the digital value corresponding to 250 kpa
- 2- What is the resolution of pressure measurements and how it can be improved to be 0.3 kpa/bit
- 3- Determine the maximum and minimum sampling time

Q3) (12 marks)

Draw the flow chart and Write an ATmega16 program for the following applications:-

- (a) Monitoring the temperature of an oven using temperature sensor, which has a sensitivity of 5mv/ $^{\circ}$ C with hysteresis $\pm 5^{\circ}$ C? There are three indication lamps used for operation indication:

LED 1 ON: When temperature is greater than 50 $^{\circ}$ C

LED 2 ON for 5 sec: When temperature is greater than 100 $^{\circ}$ C

LED 3 flash with frequency 1Hz: When temperature is greater than 150 $^{\circ}$ C

- (b) The automatic liquid bottling system shown in Fig. 1 operates by the following sequence:

- 1- Tank 1 valve and Tank 2 valve is open until both tanks is full
- 2- Both tanks heater are on for 20 seconds
- 3- Both tanks output valve is open until Mixer tank is full
- 4- Mixer motor is on for 15 seconds.
- 5- Conveyer belt is on until a bottle is in front of mixer outlet.

Members of course Examination Committee:	Signature:	Date:
Lecturer: Dr. Mostafa Abdel-Geliel		17/5/2015
Course Coordinator : Dr. Ahmed Elshenawy		17/5/2015
Head of Department: Prof. Hamdy Ashour		17/5/2015

