INTRODUCTION TO EMBEDDED SYSTEMS
(AEIE 4127)

Time Allotted : 2½ hrs **Full Marks : 60**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve: **12 × 1 = 12**

Choose the correct alternative for the following

(i) Data Memory in ATmega16 is
(a) 1K (b) 2K (c) 4K (d) 16K.

(ii) The microcontroller used in side Arduino UNO-
(a) ATmega16 (b) ATmega328p
(c) ATmega32114 (d) AT91SAM3x8E

(iii) In Atmega16,_____is/are the 16 bit timer(s)
(a) Timer0 only (b) Timer1 only
(c) Timer2 only (d) Timer1 and timer 2

(iv) In ATmega32, to initialise Port D as output Port, the DDRD register is loaded with the value
(a) FFH (b) 00H
(c) PORTD Register to be initialised (d) 01H

(v) Which of the following can be a state of task?
(a) Running (b) Blocked (c) Deleted (d) All of the above.

(vi) RTOS can be categorised in to
(a) 2 (b) 3 (c) 4 (d) 5

(vii) ISR stands for
(a) Internal Service RTOS (b) Internal Service Routines
(c) Interrupt Service Routines (d) None of These.

(viii) The ADC module inside ATmega32 is
(a) 8 bit (b) 10 bit (c) 16 bit (d) none of these.

(ix) Stepper motors are interfaced with ATmega32 through
(a) Relay Switches (b) Opto-isolators
(c) Both (a) and (b) (d) Directly interfaced through Motor driver.

(x) Step angle of a four step sequence unipolar stepper motor is 1.8^{o}. Then teeth size of Rotor is
(a) 15 (b) 30 (c) 45 (d) 50.

Fill in the blanks with the correct word

(xi) Microcontrollers are normally using _____ architecture.

(xii) VHDL is used to design _____ processor.

(xiii) Kernel is _____ in OS.

(xiv) 'Embedded systems uses only RTOS' –this statement is _____.

(xv) In 4*4 matrix key board if input port returns 00001111b sequence that means_____.

Group - B

2. (a) Describe the main components of an embedded system with one suitable block diagram. *[(CO1)(Understand/LOCQ)]*
(b) Write short notes on ARM processor. *[(CO2)(Remember/LOCQ)]*
(c) Compare the RISC and CISC architectures. Give an example for each. *[(CO1)(Compare/IOCQ)]*

5 + 4 + 3 = 12

3. (a) Discuss about the function of various memory used to build an Embedded System. *[(CO1)(Remember/LOCQ)]*
(b) Explain the advantages and disadvantages of Harvard architecture. Explain why this used mostly in Microcontrollers. *[(CO4)(Understand/IOCQ)]*

5 + (4 + 3) = 12

Group - C

4. (a) Explain the ALU operation with suitable block diagram in AVR microcontroller. Draw and describe the Status Register bit pattern of AVR microcontroller. *[(CO2)(Interpret/IOCQ)]*
(b) Write significance of Interrupt Vector Table? Describe about various sources of Interrupts in AVR. With example describe how they are enabled and disabled? *[(CO2)(Explain/IOCQ)]*

(4 + 3) + (3 + 2) = 12

5. (a) With block diagram discuss about the Data memory organisation in ATmega32. *[(CO2)(Remember/LOCQ)]*
(b) Explain the purpose of Registers of Timer0 in ATmega32. *[(CO2)(Explain/IOCQ)]*
(c) Write the flowchart/steps to generate 2 microsecond delay for a XTAL = 8 MHz using ATmega32. *[(CO2)(Solve/HOCQ)]*

4 + 4 + 4 = 12

Group - D

6. (a) What are the different types of OS? Which type of OS is used in embedded system? What is the Significance of an OS? Describe its various mode of operation. *[(CO4)(Remember/LOCQ)]*

   (b) State the differences between a Function and Service Routine. *[(CO4)(Compare/IOCQ)]*

(2 + 1 + 4 + 3) + 2 = 12

7. (a) Explain the features of RTOS. *[(CO4)(Remember/LOCQ)]*

   (b) Explain different task scheduling models of an RTOS. *[(CO5)(Explain/IOCQ)]*

(1 + 3) + 8 = 12

Group - E

8. An LCD display is interfaced with ATmega32 through single port (3 control signal Lines and 4 data lines of LCD). Write a program to display 'AEIE4127' on it. Draw the interfacing circuit diagram. *[(CO6)(Design/HOCQ)]*

(9 + 3) = 12

9. (a) Draw an interfacing diagram of 4*4 Keyboard and Atmega32. What is key de-bounce? Also write an ALP of AVR C code to check no switch pressing condition. *[(CO6)(Design/HOCQ)]*

   (b) Draw and describe the ADMUX register bit significance. *[(CO6)(Dissect/IOCQ)]*

(3 + 1 + 5) + 3 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	33.33	40.63	26.04