

**INTRODUCTION TO EMBEDDED SYSTEM
(AEI3223)**

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) The microcontroller used inside Arduino UNO-
(a) ATmega16 (b) ATmega328p
(c) ATmega32114 (d) AT91SAM3x8E
- (ii) Which memory is typically used for firmware in embedded systems?
(a) RAM (b) Cache
(c) ROM/Flash (d) Registers
- (iii) In ATmega32, to initialise Port C as input Port, the DDRC register is loaded with the value-
(a) 00H (b) 01H
(c) FFH (d) PINC Register to be initialised
- (iv) In ATmega32, the ISR address for _____ is 0000H
(a) External Interrupt 0 (b) Timer0 Overflow interrupt
(c) Reset (d) No one of the above
- (v) The ADC module inside ATmega32 is of
(a) 8 bit (b) 10 bit
(c) 16 bit (d) None of these
- (vi) Stepper motors are interfaced with ATmega32 through
(a) Relay Switches
(b) Opto-isolators
(c) Both (a) and (b)
(d) Directly interfaced through Motor driver.
- (vii) Which of the following can be sequence in a 4 step sequence unipolar stepper motor
(a) DDH (b) CCH
(c) BBH (d) Both (a) and (b).

- (viii) Which scheduling algorithm is widely used in RTOS
 (a) FCFS (b) Priority-based scheduling
 (c) Random scheduling (d) LIFO
- (ix) Context switching refers to
 (a) Switching memory
 (b) Switching hardware
 (c) Restarting system
 (d) Switching CPU from one task to another
- (x) ISR stands for
 (a) Internal Service RTOS (b) Internal Service Routines
 (c) Interrupt Service Routines (d) None of These

Fill in the blanks with the correct word

- (xi) Microcontrollers are normally using _____ architecture.
- (xii) ARM stands for _____.
- (xiii) If we are using a 8 bit ADC with 2.56V as Vcc the step-size of ADC would be _____.
- (xiv) Alternative purpose of Port A of ATmega16 is _____.
- (xv) Kernel is _____ in OS.

Group - B

2. (a) Define embedded system and compare embedded system and general computing system. [[CO1] (Compare/LOCQ)]
 (b) Give an example of an Embedded System. Now describe its embedded features. [[CO1] (Remember/LOCQ)]
 (c) Define the following: (i) Assembler, (ii) Cross-assembler. [[CO1] (Apply/LOCQ)]
(1 + 3) + (1 + 4) + (1.5 + 1.5) = 12
3. (a) Discuss about the function of various types of 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. [[CO1](Understand/IOCQ)]
5 + (4 + 3) = 12

Group - C

4. (a) Write the advantages of Serial data transfer mode over parallel data transfer. [[CO3](Understand/IOCQ)]
 (b) Describe the process of data transfer among ATmega32 and its peripherals using its SPI module. [[CO3](Explain/LOCQ)]
 (c) Differentiate SPI with any other Synchronous communication. [[CO3](Remember/IOCQ)]
3 + 5 + 4 = 12

5. (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 how various interrupts are enabled and disabled? *[[CO2] (Explain/IOCQ)]*
- (4 + 4) + (2 + 2) = 12**

Group - D

6. (a) Explain the operation of Stepper Motor'. In a stepper motor the no of tooth is a function of Step size' - Explain. *[[CO6] (Analyze/IOCQ)]*
- (b) Write the ALP /AVR C program to rotate Stepper motor with 2 degree step angle, clock wise 120 degree using 4 step sequence. (Show Calculation if any) *[[CO6] (Design/HOCQ)]*
- (2 + 2) + 8 = 12**
7. (a) Compare the command and data registers of an LCD. What are the purpose of the three pins: RS, R/W and E. *[[CO6] (Remember/LOCQ)]*
- (b) Draw an interfacing diagram of LCD and Atmega32 using 8 bit for data transfer. Also write an ALP of AVR C code for subroutine only to set LCD with the command code 01H(Clear Display), 06H(Increment cursor) and 0EH(display On, Cursor blinking). *[[CO6] (Design/HOCQ)]*
- (2 + 3) + (2 + 5) = 12**

Group - E

8. (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**
9. (a) State the differences between a Process and a Thread. *[[CO4] (Compare/IOCQ)]*
- (b) Write the significance of User Mode and Supervisory mode of OS? Describe the role of a Process Manager. *[[CO4] (Inspect /IOCQ)]*
- 3 + (5 + 4) = 12**

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	38.55	45.83	15.62

