INTRODUCTION TO EMBEDDED SYSTEM
(AEIE 4127)

Time Allotted : 3 hrs   **Full Marks : 70**

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
<u>any 5 (five)</u> from Group B to E, taking <u>at least one</u> from each group.*

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

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

    (i)   LDI R20,(1<<TOV0)
            OUT TIFR, R20
            The Above ALP does-
            (a) Set TOV0   (b) Clear TOV0.
            (c) Check when TOV0 goes to 1   (d) None of these.

    (ii)   In ATmega32, to initialise Port B as input Port, the DDRB register is loaded with the value-
            (a) 00H   (b) 01H
            (c) PINB Register to be initialised   (d) FFH

    (iii)   In ATmega 328, the ISR address for _____ is 0000H.
            (a) External Interrupt 0   (b) Reset
            (c) Timer0 Overflow interrupt   (d) No one of the above

    (iv)   The ADMUX Register has a RAM address of 27H, the IO address of the same is
            (a) 07H   (b) 27 H   (c) 17 H   (d) None these

    (v)   An LCD module is interfaced with AVR microcontroller. If the signal line RS=0, R/W=0, indicates
            (a) a data word to read   (b) a data word to write
            (c) a command word to read   (d) a command word to write

    (vi)   In ATmega 32, ADLAR=1 in ADMUX register, indicatesthe 10 bit output of ADC is configured with
            (a) 2 bits from ADCH and rest from ADCL register
            (b) 2 bits from ADCL and rest from ADCH register
            (c) 5 bits from each of ADCH and ADCL register
            (d) None of these.

(vii)   No of general purpose registers (GPRs) present in AVR is
(a) 6   (b) 10
(c) 18   (d) 32

(viii) What are valid points about thread
(a) Thread are subdivision of Process
(b) One or more Threads runs in the context of process.
(c) Threads can execute any part of process. And same part of process can be executed by multiple Threads.
(d) All of these.

(ix)   Embedded systems are designed to
(a) Measure the state of a device   (b) Change the state of a device
(c) Regulate a physical variable   (d) All of these

(x)   In Little Endian Processor to store a 2 byte of data in memory locations staring from 8000H base address which of the following is true
(a) 1st byte in 8000H and 2nd byte in 8001H
(b) 1st byte in 8001H and 2nd byte in 8000H
(c) 1st byte in 8000H and 2nd byte in 8002H
(d) 1st byte in 8000H and 2nd byte in 8003H.

Group- B

2. (a)   What is an Embedded System?[(CO1) (Remember/LOCQ)]

(b)   With one suitable block diagram discuss the main components of an embedded system.   [(CO1) (Understand/LOCQ)]

(c)   With one suitable diagram explain the working of LUT in FPGA.
[(CO1) (Analyze/IOCQ)]
2 + (1 + 4) + (1 + 4) = 12

3. (a)   Differentiate between RISC and CISC architectures? Give an example of each.
[(CO1) (Remember/LOCQ)]

(b)   Explain the role of Digital Signal Processor (DSP) in embedded system design.
[(CO1) (Understand/LOCQ)]

(c)   The NRE cost to manufacture a product is Rs.2, 50,000/- and per unit cost is Rs.2200/-. Let, the product life is 100 weeks and the product is launched in the market by a delay of 2 week.
(i)   What is the actual per unit cost to manufacture 2000 units of the embedded system?
(ii) Calculate the percentage revenue loss due to delayed product launch.
[(CO1) (Analyse/IOCQ)]
(4 + 1) + 3 + (2 + 2) = 12

Group - C

4. (a)   Discuss role of DDR, PIN and PORT registers in I/O operation of AVR microcontroller.   [(CO3) (Identify /IOCQ)]

    (b)   Discuss about the various interrupt sources in AVR. How the interruptsare disabled?   [(CO2) (Identify /IOCQ)]

    (c)   Write an ALP in AVR/C to generate 2 microsecond delay, for a XTAL=8 MHz.
    [(CO2) (Analyze/IOCQ)]
    3 + (2 + 2) + 5 = 12

5. (a)   Compare the two Assembly code of AVR microcontroller: LDS and IN.
    [(CO2) (Compare/IOCQ)]

    (b)   Write an ALP/C program to make the LED ON/OFF connected in PortB.0 following ON- OFF status of an input push switch connected on PortC.0.
    [(CO3) (Design/HOCQ)]

    (c)   Explain the ALU operation with suitable block diagram in AVR microcontroller.
    [(CO1)(Interpret/IOCQ)]
    3 + 5 + (2 + 2) = 12

Group - D

6. (a)   Explain the differences between a Process and a Thread.[(CO5) (Analyze/IOCQ)]

    (b)   Discuss about the process control block. Describe the role of a Process Manager.
    [(CO5) (Remember /LOCQ)]
    3 + (5 + 4) = 12

7. (a)   What are the goals of an Operating System? Describe the layered structure of a system.   [(CO4) (Remember /LOCQ)]

    (b)   Illustrate the significance of User Mode and Supervisory mode of OS?
    [(CO4) (Analyze/IOCQ)]
    (5 + 4) + 3 = 12

Group – E

8. (a)   Write a Program to send the output on PortD(ADCH)and Port C (ADCL) reading theroom temperature using sensor LM34/35. Draw the interfacing diagram.
    [(CO6) (Evaluate/HOCQ)]

    (b)   Point out the ADMUX register bit significance.   [(CO6) (Analyze/IOCQ)]
    (7 + 2) + 3 = 12

9. Write a program in ALP/C to display 'AEIE4127' on LCD interfaced with ATmega32. Draw a suitable block diagram.   [(CO6) (Design/HOCQ)]
    (8 + 4) = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	37.5%	35.42%	27.08%

Course Outcome (CO):

After the completion of the course students will be able to

1. Explain the definitions, components and requirements of the Embedded System.
2. Acquire knowledge in the area of embedded system using AVR microcontroller.
3. Develop the interfacing and communication techniques of the Embedded System.
4. Learn the basic concept of RTOS.
5. Understand the message passing technique, task synchronization techniques.
6. Develop algorithms for real time applications of Embedded System.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question

Department & Section	Submission Link
CSE	https://classroom.google.com/c/NDA1NjE1NjYxNTg3/a/NDY0MTQ1MDI2ODA2/details
ECE	https://classroom.google.com/c/NDA1NjE1NjYxNTg3/a/NDY0MTQzNTgzOTIx/details
IT	https://classroom.google.com/c/NDA1NjE1NjYxNTg3/a/NDY0MTQ1MDI2ODQy/details