EC-704B

EMBEDDED SYSTEMS

Time Allotted: 3 Hours | Full Marks: 70

The questions are of equal value.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

GROUP A
(Multiple Choice Type Questions)

1. Answer any *ten* questions. 10×1 = 10

(i) ARM architecture is of

(A) 32 bit (B) 8 bit
(C) 16 bit (D) none of these

(ii) A powerful modeling language used extensively in software development, specially designed for

(A) UML (B) C
(C) SMI (D) JAVA

(iii) I^2C Bus stands for

(A) intra IC connect bus (B) interface IC connect bus
(C) inter IC connect bus (D) none of these

(iv) Who determines which task/process is to be executed at a given point of time?

(A) process manager (B) context manager
(C) scheduler (D) Both (B) and (C)

(v) Which is special variation that is used to take note of certain actions to prevent any task or process from processing?

(A) semaphore (B) mutex
(C) buffer (D) counting semaphore

(vi) In embedded system design, actuator acts as a

(A) input device (B) output device
(C) Memory device (D) both (A) and (B)

(vii) USB stands for

(A) Universal serial bus (B) Uniform serial bus
(C) Universal service bus (D) none of these

(viii) In distributed embedded controller which type of bus is used?

(A) CAN bus (B) USB bus
(C) I^2C bus (D) SPI bus

(ix) Cache memory is used to reduce the speed gap between

(A) CPU and main memory
(B) CPU and secondary storage
(C) CPU and virtual memory
(D) Main memory and virtual memory

(x) Which of the following is not an embedded system?

(A) Laptop (B) Washing machine
(C) Cellular phone (D) Pacemaker

(xi) Compared to FPGA, gate array design style has

(A) less chip utilization factor (B) more chip speed
(C) more flexibility (D) none of these

(xii) DRAM is widely used because of the following:

(A) refreshing operation is not needed (B) low cost and high density
(C) low power consumption (D) high speed

GROUP B
(Short Answer Type Questions)

Answer any *three* questions. 3×5 = 15

2. (a) Define embedded system. 2
   (b) How does DSP differ from a general purpose processor (GPP)? 3

3. (a) Compare Von-Neumann and Harvard architecture of a processor based system. 3
   (b) What do you mean by memory hierarchy in an embedded system? 2

4. What do you mean by 'hardware-software co-design' for embedded systems? Explain it with a suitable block diagram. 5

5. (a) How watchdog timer is different from normal timer? 3
   (b) What is its importance in embedded system? 2

6. Explain the FPGA architecture with proper diagram. 5

GROUP C
(Long Answer Type Questions)

Answer any *three* questions. 3×15 = 45

7. (a) How does a microprocessor differ from a microcontroller? 2
   (b) What are the specific features of an embedded system processor? 4
   (c) Compare RISC and CISC architecture. 6
   (d) Now-a-days high performance embedded systems use either an RISC processor or a processor with an RISC core with a code-optimized CISC instruction set. Explain. 3

8. (a) What are the differences among direct mapping, associative mapping and set-associative mapping used in Cache Memory Organization? 5
   (b) Design an interface circuit to connect an 8 KB RAM chip to the 8051 microcontroller. 10

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9. Define RTOS. In what respect RTOS is different from general purpose Operating System? 2+2+4+4+
   Write down some important RTOS service. Discuss how "Interrupt source call" are handled by RTOS.
   Name three popular RTOSs used in mobile phones, starting from the most popular.

10. (a) What are the features of UML?
    (b) Define any FOUR of the following terms in relation to UML:
    (i) Class (ii) Abstract class (iii) Signal (iv) Package (v) Object
    (c) What are the problems faced in modelling the processes in a multiprocessor systems?
    (d) Draw an FSM model of an automatic chocolate vending machine. The machine permits only one type of coin Rs. 1, one chocolate at a time and one chocolate is cost Rs. 8.

11. What is a kernel? Discuss in brief about monolithic and microkernels. Discuss in brief about the differences between a process and a thread. Show the schematic view of a multi-threaded system. What is a binary semaphore? 2+3+3+5+2

12. Write short notes on any *three* of the following: 3×5
    (a) Bluetooth
    (b) RFID
    (c) USB
    (d) System on chip (SOC)
    (e) JTAG
    (f) Flash memory.