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Paper Code : EC-704B

EMBEDDED SYSTEMS

Time Allotted : 3 Hours | *Full Marks* : 70

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. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) 8051 microcontroller is a

a) RISC processor b) CISC processor

c) VLIW processor d) MISD processor.

ii) In embedded system design, actuator acts as a/an

a) Input Device b) Output Device

c) Memory Device d) Both (a) and (b).

iii) Which one is a serial synchronous communication protocol ?

a) RS232C b) PCI

c) USB d) I^2C.

iv) In distributed embedded controller, which type of bus is used ?

a) USB bus b) CAN bus

c) I^2C bus d) None of these.

v) Which of the following is not an embedded system ?

a) Laptop b) Washing Machine

c) Cellular Phone d) Pacemaker.

vi) Which one of the following is an RTOS ?

a) Windows NT b) Unix

c) Ubuntu d) Windows CE.

vii) G-Sensor is used to sense

a) Position b) Pressure

c) Acceleration d) Gravitational Force.

viii) A program that combines object code files into an executable program is called a/an

a) Complier b) Linker

c) Loader d) Assembler.

ix) How many layers are there in an embedded system design ?

a) 2 b) 3

c) 4 d) 5.

x) Which one of the following scheduling algorithm checks the rate of occurrence of the task ?

a) RMA b) EDF

c) Co-Operative d) All of these.

xi) An embedded system hardware can

a) have microprocessor or microcontroller or single purpose processor

b) have digital signal processor

c) one or several microprocessor or microcontroller or digital signal processor or single purpose processors

d) not have single purpose processors (s).

xii) Which of these are real-time applications scenarios ?

a) An online bus ticketing system

b) Printing of annual report of a company's annual report

c) Reconciling a day's transactions in an account book of a small company

d) An aircrafts' yaw control system.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Illustrate different layers of an embedded system.

3. Explain the need of Watchdog Timer in an embedded system and briefly describe its working principle. 2 + 3

4. What is the difference between RISC and CISC processor ? Give an example of each processor. 3 + 2

5. What is meant by a transducer ? What do you mean by task, process and threads ? What is semaphores ? 1 + 1 + 1 + 1 + 1

6. Describe USB communication protocol.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) What is Embedded System ? Describe the features of an embedded system.

b) Mention the various design metrics that need to be considered in embedded system design.

c) Distinguish between General Purpose Processor and DSP processor.

d) Give an example of multi rate characteristics of an embedded system. 2 + 4 + 5 + 3 + 1

8. a) Name one synchronous communication protocol that uses less BUS width (less pin) for communication. Describe its interface and data transfer technique.

b) What is the need of separate time/counter device in an embedded system ?

c) Describe the CAN protocol. Which feature of it makes it suitable of embedded application, particularly in automation ? 1 + 5 + 2 + 5 + 2

9. a) What are the fundamental issues in hardware software co-design in embedded system ?

b) Describe state machine programming model of a Fibonacci sequence generator.

c) Illustrate UML specification of an elevator control system. 5 + 5 + 5

10. a) Differentiate between general purpose OS and real time OS.

b) Classify tasks based on their periodicity values. Give example.

c) What do you mean by multi-processing and multi-tasking ? Give an example of each. 5 + 6 + 4

11. a) What is actuator ? Give a brief description of working principle of Microphone. How it can convert sound energy to electrical energy ?

b) Why task synchronization needed ? Illustrate the concept of semaphore for task synchronization.

c) What are the disadvantages of embedded programming in C++ and JAVA ? How it can be optimized to eliminate the disadvantages ?

1 + 4 + 2 + 3 + 2 + 3

12. Write short notes on any *three* of the following : 3 × 5

a) RFID

b) Bluetooth

c) Qualities of a good RTOS

d) WISENET

e) RTC

f) PCI Express.