Question Paper Code : 70079

M.E./M.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

First Semester

Applied Electronics

AP 5191 – EMBEDDED SYSTEM DESIGN

(Common to M.E. Digital Signal Processing/M.E. Software Engineering/
M.E. VLSI Design)

(Regulations 2017)

Time : Three Hours   Maximum : 100 Marks

Answer ALL questions

PART – A   (10×2=20 Marks)

1. List and define the three main characteristics of embedded systems that distinguish such systems from other computing systems.

2. Discuss the concept of NRE cost with an example.

3. If Moore's law continues to hold, predict the approximate number of transistors per leading edge IC in :

   a) 2020,

   b) 2040.

4. List the steps by which a timer works.

5. What is the difference between a VLIW and superscalar processor ?

6. What are the important features of the I²C protocol ?

7. Distinguish between SRAM, DRAM and Flash memory technologies.

8. Explain the terms :

   i) State

   ii) Transition.

9. Explain how the concept of 'timeouts' are used.

10. Name two Real Time Operating Systems.

PART – B   (5×13=65 Marks)

11. a) i) What are the special features that need to be taken into consideration when designing an embedded system ? Elaborate.   (6)

    ii) Also make clear the criteria by which you select the processor to be used in the design.   (4)

    iii) Explain how the peripherals ADC and PWM are used in a microcontroller.   (3)

(OR)

b) i) Explain why single-purpose processors (hardware) and general-purpose processors are essentially the same, and then describe how they differ in terms of design metric.   (6)

    ii) Design a soda machine controller, given that a soda costs 75 paise and your machine accepts 25 paisa coins only. Draw a black -box view, come up with a state diagram and state table, minimize the logic, and then draw the final circuit.   (7)

12. a) Discuss the operation of the following components in a microcontroller :

    1) Watch dog timer

    2) UART

    3) RAM

    4) ROM.

(OR)

b) i) Draw the block diagram of an embedded processor and explain its features.   (7)

    ii) Illustrate the programmer's view of the above processor and discuss five important instructions associated with this processor.   (6)

13. a) i) What is meant by the terms bus protocol and bus arbitration.   (7)

    ii) Elaborate the CAN protocol with details of how it does bus arbitration.   (6)

(OR)

b) Discuss the salient features of the following buses :

    1) Bluetooth

    2) WiFi

    3) USB

    4) PCI.

14. a) Take the case of an FSM model of any typical embedded system. Discuss different approaches for implementing state machines.

(OR)

b) Discuss the concepts involved in the following processes :

   1) Synthesis. (4)

   2) Verification. (4)

   3) Hardware-software co-simulation. (5)

15. a) 1) Distinguish between and emulator and simulator. Mention the uses and shortcomings of each. (7)

   2) Describe the necessary elements in an embedded system test set-up. With the aid of an example, outline a strategy for testing embedded software on a host system. (6)

(OR)

b) 1) Enumerate the steps in the process of compilation. What is a cross compiler ? (5)

   2) Explain the idea of dynamic linking. (5)

   3) What is meant by a run time library ? (3)

PART – C　　　　(1×15=15 Marks)

16. a) 1) What are the debugging methods used in embedded system design ? Explain. (5)

   2) List and describe the tools available for testing and debugging an embedded system design. (5)

   3) What do you know of BDM and JTAG ? Elaborate. (5)

(OR)

b) 1) With a help of a block diagram, explain the design of a 'vehicle theft and accident detection system' which has internet connectivity and sends messages to a web page and also to a mobile phone. (5)

   2) Which processor would you use ? (5)

   3) Explain the software development, starting from a flow chart. (5)

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