Code : 105816

B.Tech 8th Semester Exam., 2022

(New Course)

EMBEDDED SYSTEMS

Time : 3 hours   Full Marks : 70

Instructions :

(i) The marks are indicated in the right-hand margin.

(ii) There are **NINE** questions in this paper.

(iii) Attempt **FIVE** questions in all.

(iv) Question No. **1** is compulsory.

1. Choose the correct option of the following
(any *seven*) :   2×7=14

(a) An embedded system is a/an _____ system.

     (i) electronic

     (ii) mechanical

     (iii) electro-mechanical

     (iv) either (i) or (iii)

(**2**)

(b) Which general purpose register of the ARM programming model also works as program counter?

     (i) r0

     (ii) r1

     (iii) r10

     (iv) r15

(c) Which of the following is not the load-store type of ARM instruction?

     (i) LDRH

     (ii) STRB

     (iii) TST

     (iv) ADR

(d) Polling is seen in _____ I/O.

     (i) normal

     (ii) busy-wait

     (iii) interrupted

     (iv) None of the above

(e) Which of the following best supports pipelining?

     (i) RISC

     (ii) CISC

     (iii) Both (i) and (ii)

     (iv) None of the above

(f) The power consumed in CMOS circuits is _____ to the toggling of inputs.

   (i) directly proportional

   (ii) inversely proportional

   (iii) not related

   (iv) None of the above

(g) _____ is not a RISC architecture.

   (i) ARM

   (ii) MIPS

   (iii) SHARC

   (iv) PowerPC

(h) Which of the following is not an interfacing component for any embedded system?

   (i) Watchdog timer

   (ii) A/D and D/A converters

   (iii) Memory

   (iv) Testbench

(i) Which of the following provides absolute addresses to a program?

   (i) Linker

   (ii) Loader

   (iii) Assembler

   (iv) None of the above

(j) Which of the following is not a code optimization technique?

   (i) Statement translation

   (ii) Dead code elimination

   (iii) Loop unrolling

   (iv) Expression simplification

2. (a) What is an embedded system? Comment on the embedded system characteristics.   5

(b) What is the role of microprocessor or microcontroller in embedded system design? List down other technologies usable for embedded design.   5

(c) Briefly explain the embedded system design process.   4

3. (a) Define requirements in perspective of embedded system design process. Explain with proper categorization of the requirements. 8

   (b) Take an example application 'GPS Moving Map'. Create a requirement form which well describes the requirements of this application, for its design. 6

4. (a) Discuss about the language used for describing specifications. 5

   (b) Differentiate between the top-down and bottom-up approaches of the embedded system design. 5

   (c) Differentiate between the RISC and CISC system architectures. 4

5. (a) Write four key characteristics of a generalized instruction. 3

   (b) Write a short note on the ARM programming model. 4

   (c) List down the ARM instructions with proper categorization. 7

6. (a) What are the conditional codes in ARM? Explain with few examples. Take an example C code with conditional statement and implement the same in ARM assembly language. 10

   (b) Write few lines about SHARC programming model. 4

7. (a) Differentiate between I/O instructions and memory-mapped I/O. Why do most CPU architectures use memory-mapped I/O? Explain. 5

   (b) What is an Interrupt? Why do you use interrupted I/O? Discuss about interrupt prioritization and interrupt overhead. 7

   (c) Define pipelining. 2

8. (a) Take reference of three-stage ARM pipeline to explain the Branch Penalty. 5

   (b) How latency and throughput relate to the CPU performance? Explain. 5

   (c) Draw timing diagram for a write operation with no wait states. 4

9. (a) How do we interface memory chip with CPU? Explain. Also explain the case of multichip memory interfacing. 6

(b) Discuss about the debugging techniques in short. 4

(c) Discuss about different types of code optimization used while assembly code compilation. 4

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