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| **Name:**<br>**Enrolment No:** |  |

**UPES**

**End Semester Examination, December 2023**

**Program Name:** B.Tech. (CSE-H+NH)-IOTSC **Semester : 5th**

**Course Name:** Realtime Operating Systems Internals **Time : 3 hrs**

**Course Code:** CSTI3009 **Max. Marks : 100**

**Nos. of page(s): 2**

**Instructions**: **All the questions are compulsory.**

**Abbreviations used: 1) Realtime operating system: (RTOS)**

**SECTION A**
**(5Qx4M=20Marks)**

| S. No. | | Marks | CO |
|---|---|---|---|
| Q 1 | Differentiate between Serial and Parallel transmission in Guided media? | **4** | **CO1** |
| Q2 | Explain any two requirement elicitation techniques. | **2 * 2 = 4** | **CO3** |
| Q3 | Discuss any two real world embedded systems belong to hard realtime systems. | **2 * 2 = 4** | **CO2** |
| Q4 | Discuss a hardware description language used to design FPGA circuits? | **4** | **CO2** |
| Q5 | Discuss the various types of Processors in context of a real-time embedded system? | **4** | **CO1** |
| **SECTION B**<br>**(4Qx10M= 40 Marks)** | | | |
| Q6 | Discuss five differences between software testing and embedded system testing. | **5+ 5 = 10** | **CO3** |
| Q7 | What are the various types of tasks in Real time systems? Give one example of hard time real time systems in each type of task. | **5 + 5 = 10** | **CO2** |
| Q8 | There are 5 events in the periodic task. The initial start time is 15 sec, each event will be executed for 5 sec, and there is a time gap between two events. The time gap is of 3 sec. What will be the last timestamp after completing all the 5 events? If the relative deadline is 56 sec and the system completes all the events in $55^{th}$ sec with one event failure, then which type of realtime system it is? Justify your answer. | **5 + 5 = 10** | **CO2** |
| Q9 | Discuss the need of Field Programmable Gate Arrays (FPGA) to reduce the e-waste? Illustrate the architecture of the FPGA. | **2 * 5 = 10** | **CO2** |
| **SECTION-C**<br>**(2Qx20M=40 Marks)** | | | |
| Q10 | A company would like to setup an embedded system with following requirements: | **4 * 5 = 20** | **CO1, CO2** |

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|---|---|---|---|
| | 1) A realtime embedded system with 0% failure rate.<br>2) Less to very less computation required.<br>3) The size of embedded system should as small as possible.<br>4) Two input sensors and 1 output communication device.<br>Answer each of the following questions on the basis of the above requirements.<br><br>Explain the reason behind the selection of your choice of RTOS (Hard RTOS/Soft RTOS, Firm RTOS)? Upto what level of Cache memory will be chosen? What type of processor will be chosen w.r.t size? Which type of Direct memory access (DMA) controller you require to handle I/O operations? | | |
| Q11 | An embedded system must be designed which is easily available in the global market. The company has very limited funds and the deadline to develop the embedded system is very short. The correctness of the developed system is medium. Explain the best suited development life cycle for such requirements.<br>**OR**<br>What is built-in-self-test (BIST) method? How an embedded system can have its own BIST before deploying into production? What is boundary scan method testing? | **20**<br><br>**OR**<br><br>**5 + 10 + 5 = 20** | **CO3** |