

Roll Number: \_\_\_\_\_

**Thapar Institute of Engineering & Technology, Patiala**

Department of Computer Science & Engineering

**AUXILIARY END SEMESTER EXAMINATION (Feb 2024)**

B. E.(COE) (Final Year): Semester-VII February 26, 2024

Course Code: UCS704

Course Name: Embedded Systems Design

Time: 3 Hours, M. Marks: 100

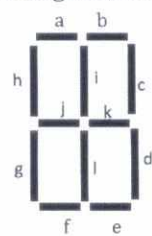
Tuesday, 05:30 PM – 08:30 PM

Faculty: Dr. Ranjeet Kumar Ranjan

**Note:** Attempt all questions. All parts of a question must be answered in order. Assume missing data, if any, suitably.

- Q.1** (a) Draw a circuit diagram for Brown Out Reset used in an Embedded system (7)  
and explain its role and working mechanism.  
(b) How Brown Out Reset is different than Watchdog Timer? (3)
- Q.2** (a) Explain the differences between ASIC and FPGA Designs. (4)  
(b) Discuss the following three architectural models for specifying the functionality of a circuit: (6)  
I. Behavioural model  
II. Data flow model  
III. Structural model
- Q.3** (a) Explain the Power on Reset circuit and its working mechanism using a (8)  
circuit diagram.  
(b) Why we need the manual push button in Power on Reset circuit? (2)
- Q.4** (a) Draw a block diagram which is used to store 1 bit of information and (8)  
explain how it store 0 and 1.  
(b) Why is SRAM the preferred memory technology for caches? (2)
- Q.5** Write the necessary condition for the RMA (Rate Monotonic Algorithm). For (10)  
the task set given the table, check whether the given tasks are schedulable  
or not using the Rate Monotonic Algorithm. Justify your answer. Draw the  
Gantt chart with tasks illustrating the execution of these tasks with RMA on  
both separate time axis and same time axis.

Task	Period (msec)	CPU burst (msec)
T1	15	2
T2	12	3
T3	20	5
T4	25	4

- Q.6** (a) A float type variable Y is assigned the decimal value of -14.25. Represent the number in Hexadecimal after converting through single-precision 32-bit floating point format IEEE-754 standard. (7)  
 (b) Discuss the Two Level Cache architecture used in Digital Signal Processing. (3)
- Q.7** LED display is a popular choice to show alphanumeric information in many embedded system applications. Twelve segments LED is one such display device which uses 12 LEDs to represent various alphabet and numbers as shown in Fig.1. Assume common cathode connection to connect all 12 LEDs, "a" as the LSB bit, "l" as MSB bit and refer remaining bits in alphabetic order. Find the 12 segment codes (in binary) to display following characters. (10)
- |      |             |
|------|-------------|
| i)   | V (capital) |
| ii)  | a (small)   |
| iii) | Y (capital) |
| iv)  | 8 (capital) |
| v)   | h (small)   |
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- Fig.1: 12 segment LED display
- Q.8** (a) Discuss the different components used in an IoT system. Also explain the risks and challenges associated with IoT. (6)  
 (b) List and explain any four real-world application of IoT. (4)
- Q.9** Explain the applications of Relays in embedded systems. Discuss the Electromechanical Relays and its working mechanism. (10)
- Q.10** (a) Discuss the Finite State Machines and its role in embedded system design. (5)  
 (b) Draw a Finite State Machine for a traffic signaling system. (5)

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