

2125

M. Tech. (Micro-Electronics)

First Semester

MIC-107: Embedded System Design

Time allowed: 3 Hours

Max. Marks: 50

**NOTE:** Attempt five questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part.

x-x-x

- Q1.** (a) List typical characteristics of an embedded system? Give suitable examples. (2)  
 (b) What kind of services are provided by RTOS? (2)  
 (c) Why single-processor architectures are preferred over regular processors in embedded systems? (2)  
 (c) What role is played by signal conditioning in embedded system interfacing? (2)  
 (d) Name any two hardware testing tools used in embedded systems along with their applications. (2)

**PART-A**

- Q2.** Describe in detail basic hardware architecture of an embedded system with a neat block diagram. Also explain functions of processor, memory, I/O ports, timers, and interrupts units. (10)
- Q3.** a) Critically compare memory-mapped and I/O-mapped I/O schemes. (5)  
 b) Contrast Von Neumann and Harvard memory architectures and discuss key metrics used to evaluate the performance of high-performance embedded systems. (5)
- Q4.** (a) Explain the role of Embedded C++ in embedded system design. Explain how object-oriented programming concepts improve modularity, reusability, and maintainability in embedded applications. (5)  
 (b) Explain task scheduling, inter-task communication, and interrupt handling functions of kernel in an embedded system. (5)

**PART-B**

- Q5.** (a) Why modelling tools are required in multiprocessor embedded system design. Explain role of these tools in task partitioning, scheduling, and performance analysis. (5)  
 (b) Explain the concept of SoC IP cores. Differentiate between soft IP, firm IP, and hard IP cores with suitable examples. (5)
- Q6.** a) What is a distributed embedded system? Explain its architecture and discuss its advantages and applications. Also explain design challenges in such systems. (5)  
 b) Explain the development phase of an embedded system design cycle. How does hardware software co-development improve system reliability and reduce time-to-market. (5)
- Q7.** Illustrate digital signal conditioning techniques used in embedded systems. Explain sampling, quantization, filtering, and noise reduction along with their importance in real-time embedded applications. (10)

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