

CE7-R3: REAL-TIME SYSTEMS

NOTE:

1. Answer question 1 and any FOUR questions from 2 to 7.
2. Parts of the same question should be answered together and in the same sequence.

Time: 3 Hours

Total Marks: 100

1.
 - a) What do you understand by the term 'temporal data' in the context of real-time databases? Give some practical examples of temporal data.
 - b) Define network-flow graph and explain its usefulnesses. Draw a network-flow graph that we can use to find a preemptive cyclic schedule of the periodic tasks $T_1 = (3, 1, 7)$, $T_2 = (4, 1)$, and $T_3 = (6, 2, 4, 8)$.
 - c) Classify real-time applications based on their timing attributes, and exemplify.
 - d) How does fault-tolerance system manage redundancy? Explain briefly different types of redundancy.
 - e) Explain why centrally controlled clock system are often called master Slave System?
 - f) When two messages collide in the window protocol, due to having identical LTTT values, what would happen if the random number generators associated with the respective nodes generated the same sequence of random numbers?
 - g) When two clocks are said to be synchronized. Explain what is internal synchronization?
(7x4)

2.
 - a) Describe, how faults are classified and explain them with a state diagram.
 - b) Which is the protocol widely sued for single channel broadcast network in the bus and ring topologies? Explain and draw the algorithm of this protocol.
 - c) What are the various necessary conditions for deadlock?
(6+6+6)

3.
 - a) What do you mean by real-time system design process? Why is it important?
 - b) Specify the requirements involved in real-time system design process.
 - c) Specify the necessity of distinguishing the step system integration involved in real-time system design process.
(6+6+6)

4.
 - a) What are the different optimizing design metrics involved in designing a real-time system? How are they competing with each other?
 - b) How can fault tolerant communication be achieved in the presence of link and node failures?
 - c) Write a short note on Application-Specific Processors.
(10+5+3)

5.
 - a) What are the key tools available for Run time support? How does debugger allows program execution and insertion of break points.
 - b) State whether processor technology is independent from IC technology. How are they related?
 - c) State the reasons for Real-Time databases to compromise some of the ACID properties of conventional databases.
(8+6+4)

- 6.**
- a) What are the benefits of using a general-purpose processor in the case of designing a real-time system? In this context, describe the benefits of using a standard single-purpose processor instead of using a general-purpose one.
 - b) Differentiate registers from memory. Compare Princeton architecture and Harvard architecture. How is Cache memory related to real-time computing system?
- (9+9)**

- 7.** Write short notes on any **three** of the following:
- i) Remote Procedure Calls (RPC)
 - ii) Transaction Aborts
 - iii) Concurrency Control Issues
 - iv) Bin Packing Problem

(6x3)