

C

Reg. No. :

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

**Question Paper Code: 99407**

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2024

Elective

Electronics and Communication Engineering

19UEC907 REAL TIME SYSTEM DESIGN

(Regulations 2019)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Define Events and its types in detail. CO1-U
2. Explain the common misconceptions on real time system design. CO1-U
3. Discuss about the memory technologies involved in real time systems. CO2 -U
4. List the summary of memory technologies. CO2-U
5. Discuss the difference between static and dynamic, on-line and off-line, optimal and heuristic scheduling algorithms. CO2-U
6. Compare and contrast the different memory technologies discussed in this chapter as they pertain to real-time systems. CO2-U
7. Elaborate the properties of software to design real time system. CO2-U
8. Compare EDF scheduling over RM scheduling. CO2-U
9. List the advantages and disadvantages of writing a BAM object class in an object- oriented language. CO2-U
10. Explain the brief summary of languages for object oriented designs. CO2-U

PART – B (5 x 16= 80 Marks)

11. (a) (i) Explain in detail about Events and its types.(10) CO1-U (16)  
(ii) Explain in detail about Determinism.(6)
- Or
- (b) (i) Elaborate the issues undergone while designing real time system. CO1-U (16)  
(10)  
(ii) Summarize the common misconceptions of designing real time system. (6)

12. (a) (i) Explain in detail about the internal organization of CPU.(10) CO2-U (16)  
(ii) Draw the block diagram of microcontroller used in RTS.(5)
- Or
- (b) (i) Draw the internal structure of a typical CPU.(6) CO2-U (16)  
(ii) Explain in detail about the block constitutes in CPU.(9)
13. (a) For the following kinds of systems give your best recommendation as to the most likely commercial real-time operating system to use based on the selection criteria you developed CO3-App (16)  
(i) A controller application for the fuel injection system of a passenger car.  
(ii) A hand-held game application.  
(iii) The F-16 navigation system.  
(iv) An animatronic robot used in the filming of a new science fiction movie.  
(v) A medical device that reduces the time needed for an MRI scan.  
Make whatever assumptions you like, but document them.
- Or
- (b) Consider a hospital's patient monitoring system for the below conditions CO3-App (16)  
(i) Each patient is connected to machines monitoring blood pressure, heart rate, and ECG. These machines issue a Boolean signal indicating a FAIL or WORKING condition.  
(ii) The results of each of these machines are ORed together to form a signal called ALARM. The ALARM signals for each of the rooms (one patient per room) are then ORed together and sent to the nurse's station.  
(iii) If any machine on any patient indicates a failure, the emergency alarm is sounded and the nurse is directed to the appropriate patient and machine.  
Draw a data flow diagram for such a system
14. (a) Consider thirteen selection criteria,  $m_1 \cdot \cdot \cdot m_{13}$ , each having a range  $m_i \in [0, 1]$  where unity represents the highest possible satisfaction of the criterion and zero represents complete non satisfaction. CO4-App (16)
- Or
- (b) Construct the schedule for the security system using CO4-App (16)  
(i) The Priority Inheritance Protocol  
(ii) The Priority Ceiling Protocol

15. (a) A computer has instructions that require two bus cycles, one to fetch the instruction and one to fetch the data. Each bus cycle takes 250 nanoseconds and each instruction takes 500 nanoseconds (i.e., the internal processing time is negligible). The computer also has a disk with 16,512 byte sectors per track. Disk rotation time is 8.092 milliseconds. To what percentage of its normal speed is the computer reduced during DMA transfer if each DMA takes one bus cycle. Consider two cases:  
8-bit bus transfer and 16-bit bus transfer.

Or

- (b) A producer process is known to be able to process data at a rate that is exponentially distributed with average service time of 3 milliseconds per datum. Apply the rule to find the maximum allowable average data rate if the probability of collision is to be 0.1%? Assume that the data arrive at intervals that are exponentially distributed.

