M.E. Second Semester (Computer Science & Engineering) (F. T.) (CGS)

13150 : Real Time Systems : 2 RMEF 3 / 4 RME 1

P. Pages : 3 | AU - 3229

Time : Three Hours | Max. Marks : 80

* 0 9 6 3 *

Notes :
1. All question carry equal marks.
2. Due credit will be given to neatness and adequate dimensions.
3. Assume suitable data wherever necessary.
4. Diagrams should be given wherever necessary.
5. Illustrate your answer necessary with the help of neat sketches.
6. Use of pen Blue/Black ink/refill only for writing the answer book.

1. a) How does the timing attribute divide the Real - time process in various categories? Explain each in detail. **7**

b) What would be the contribution of functional parameter while implementing the model of real - time system in view of scheduling and resource access. **7**

OR

2. a) Discuss the various types of real - time applications. Give examples. **7**

b) Job - 1 / Job - 2 denotes a pipe. The result produced by Job - 1 is incrementally consumed by Job - 2. (As an example, suppose that Job - 2 reads and display one character a time as each handwritten character is recognized and placed in a buffer by Job - 1). Draw a precedence constraint graph to represent this producer - consumer relation between the jobs. **7**

3. a) Explain preemptive and non - preemptive priority driven scheduling with suitable example. **7**

b) Differentiate between following : **6**

i) Dynamic and Static Systems.

ii) On - line scheduling and Off - line scheduling.

iii) Round - robin scheduling and Weighted Round - robin scheduling.

OR

4. a) A system contains nine nonpreemptable jobs named J_i for $i = 1,2.....9$. Their execution time are [3,2,2,2,4,4,4,4,9], respectively, their release times are equal to 0, and their deadlines are 12. J_1 is immediate predecessor of J_9 and J_4 is immediate predecessor of J_5, J_6, J_7 and J_8. There is no other precedence constraints. For all the jobs, J_i has a higher priority than J_k, if $i < k$. **7**

i) Draw the precedence graph of the jobs.

ii) Can the jobs meet their deadlines if they are scheduled on three processors? Explain your answer.

b) Why EDF algorithm is not optimal if the preemption is not allowed? Explain. 6

5. a) Each of the following systems of periodic tasks is scheduled and executed according to a cyclic schedule. For each system, choose an appropriate frame size. Preemptions are allowed, but the number of preemptions should be kept small. 8
   i) (8, 1), (15, 3), (20, 4) and (22, 6).
   ii) (4, 0.5), (5, 1.0), (10, 2) and (24, 9).
   iii) (9, 5.1, 1, 5.1), (8, 1), (13, 3) and (0.5, 22, 7, 22)

   b) Discuss the advantages and disadvantages of clock-driven scheduling. 5

OR

6. a) Draw a network - flow graph that can be used to find a preemptive cyclic schedule of the periodic tasks $T_1 = (3,1,7)$, $T_2 = (4,1)$ and $T_3 = (6,2.4,8)$. 7

   b) Give the meaning of each of the following practical situations and explain the method for handling each situation : 6

      i) Frame Overruns.

      ii) Mode changes.

7. a) Explain scheduling utilization of Rate - monotonic (RM) algorithm for multiframe task. 7

   b) A system T contains four periodic task, (8, 1), (15, 3), (20, 4) and (22, 6). Its total utilization is 0.87. Construct the initial segment in the time interval (0, 50) of a rate - monotonic schedule of the system. 7

OR

8. a) Explain Rate - monotonic and Deadline monotonic fixed priority algorithms. 7

   b) Use the time - demand analysis method to show that the set of periodic tasks {(5, 1), (8, 2), (14, 4)} is schedulable according to the rate - monotonic algorithm. 7

9. a) Define simple sporadic server. Explain the consumption rules and replenishment rule for a simple fixed priority sporadic server. 7

   b) A system contains three periodic task : (2.5, 0.5), (3, 1) and (5, 0.5). The system also contains a sporadic server whose period is 4. The server is scheduled with the periodic task rate - monotonically. Find the maximum execution budget of the server so the periodic tasks remain schedulable. 6

OR

10. a) Explain the following approaches with reference to improve performance of a scheduling algorithm with suitable example : 7
   i) Background
   ii) Polled Execution
   iii) Interrupt - Driven Execution

b) In a fixed priority system for two periodic task $T_1 = (3,1)$ and $T_3 = (9,3)$, there is a sporadic server $(p_s e_s) = (8,2)$. Suppose that two aperiodic jobs A_1 & A_2 arrive at time 0.5 and 5, respectively, their execution times are both equal to 1. What is the response time of A_2 if the server is a simple sporadic server? 6

11. a) A system contains the following five periodic tasks. The tasks are scheduled rate - monotonically. Compare the schedulability of the system when the priority ceiling protocol is used verses the NPCS protocol : 7

$T_1 = (6,3,[X;2])$

$T_2 = (20,5,[Y;1])$

$T_3 = (200,5,[X;3[Z;1]])$

$T_4 = (210,6,[Z;5[Y;4]])$

b) Explain in brief non - preemptive critical section. 6

OR

12. a) Consider a fixed - priority system in which there are five tasks T_i, for $i = 1,2,3,4$ and 5, with decreasing priorities. There are two resources X and Y. The critical sections of T_1, T_2, T_4 and T_5 are [Y;3],[X;4],[Y;5[X;2]], and [X;10]respectively. Note that T_3 does not require any resource). Find the blocking time $b_i(rc)$ of the task. 7

b) Explain priority - ceiling protocol with example. 6

****