

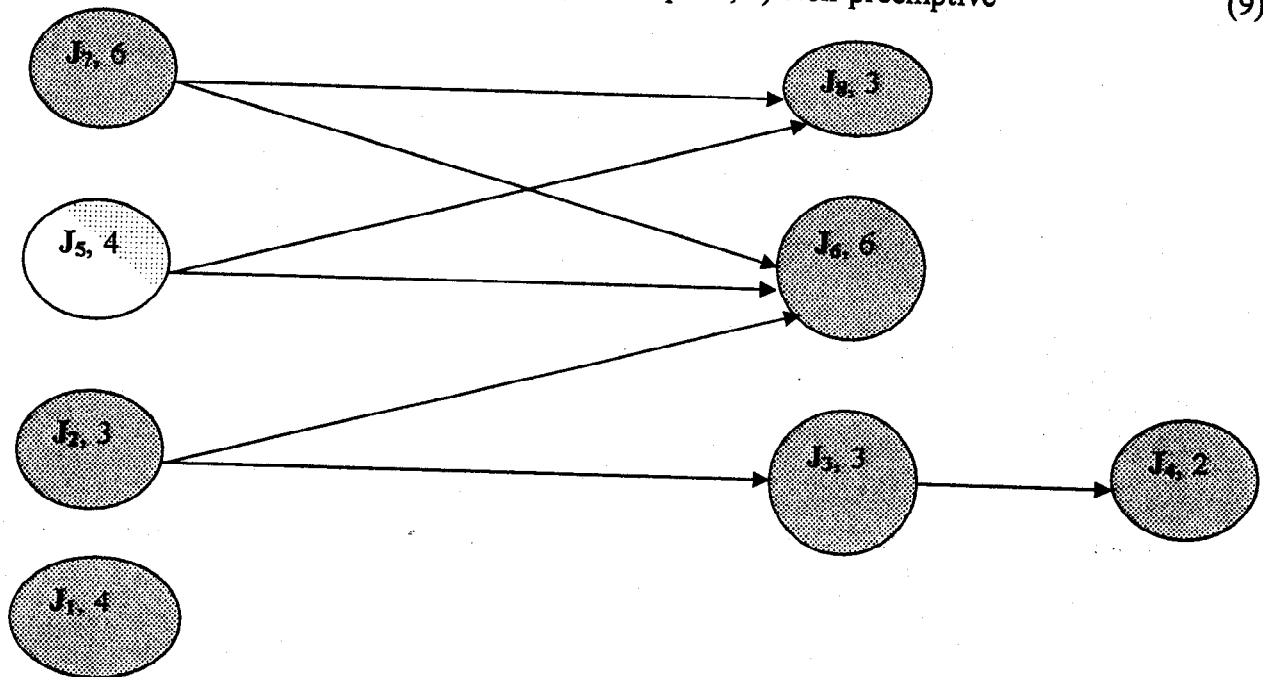
BITS, PILANI – DUBAI CAMPUS,
 KNOWLEDGE VILLAGE, DUABI
 FIRST SEMESTER 2004-2005
 TEST – I (CLOSED BOOK)

Course: CS UC 444 Real-Time Systems
 Weightage: 20 %
 Max. Marks: 40

Date: 10.10.2004
 Time: 50 mins

Note: All questions are compulsory. Write any assumption made with its requirement.

1. What do you mean by *sampling period*? Briefly explain. (2)
2. What is *tracking* and *gating* in a Radar Signal Processing and Tracking Systems? (2)
3. Give the definition for *Relative Deadline* and *Absolute Deadline*. (2)
4. What is the meaning of the symbols $[r_i^- \ r_i^+]$ used in the Real-Time systems representation. (2)
5. Mention the scheduling Algorithms that comes under *Priority-driven Scheduling* based on *Release Time* and *Execution Time*. (2)
6. Discuss whether or not the following are *hard or soft* real-time systems: (8)
 - a) The computer system controlling the Panama Canal locks.
 - b) A computer-controlled routing switch used by a phone company.
 - c) A computer controlled arcade game.
 - d) The U.S postal service's mail-processing systems, which scans a letter as it moves through a Conveyor belt and routes it to the appropriate bin depending on ZIP code.
7. Mention, how many addressing modes are there in Macroinstructions set? Give examples (3)
8. Give the difference between RISC and CISC machines. (5)
9. Explain and give the block diagram of Programmable Interrupt Controller, and handling of multiple interrupts with an interrupt handler. (5)
10. A classical precedence graph with all its edges represent precedence constraints is shown below with their timing constraints, job5 is released at time 5 and all the other jobs are released at time zero. You have to give the schedule that execute the jobs on two processors base on priority-driven Scheduling under the two possible cases: a) Preemptive, b) Non-preemptive (9)



Real-Time Systems CS UC 444
 Weightage: 40%
 Max. Marks: 40

Date: 06.01.2005
 Time: 3 Hrs.
 Closed Book

Note: All questions are compulsory. Write any assumption made with its requirement. Symbols have usual meaning.

1. What is major constraint that distinguishes Real-Time System from Non-Real-Time System? (1 mark)
2. What will be Time complexity of gating? When there are n established trajectories and m measured values. (1 mark)
3. What do you mean by Random Deadline with blocking? (2 mark)
4. Give the formula for calculate the number of jobs in each Hyper period? (1 mark)
5. When a job is said to be preemptable or non-preemptable. Explain? (3 marks)
6. Under what condition, we will choose the Latest Release Time Algorithm to produce a feasible schedule. (3 marks)
7. What do mean by Online and Offline Scheduling? Give example for each. (2 marks)
8. What are the *three* constraints that determine the frame size, explain them. (3 marks)
9. Consider the following four fixed priority tasks:
 $T1 = (3, 1)$, $T2 = (5, 1.5)$, $T3 = (7, 1.25)$, $T4 = (9, 0.5)$. Give the time-demand function $w_4(t)$ of $T4$ and also give the time-demand analysis for the above sets of tasks. (4 marks)
10. Check whether the application given below is *harmonic or not* and calculate the total utilization.

Task	Runtime e_i	Period p_i	Utilization	Priority
T1	3	9	?	?
T2	6	18	?	?
T3	8	36	?	?

(3 marks)

11. Calculate the following: response time a_0 , total utilization and check whether the Task T3 is schedulable are not.

Task	p_i (ms)	e_i (ms)	priority	blocking	Deadline
T1	100	40	?	0	100
T2	150	50	?	0	150
T3	400	70	?	0	270

(7 marks)

12. What is the physical significance of given equation (inequality) and the symbols have usual meaning.

$$2f - gcd(p_i, f) \leq D_i$$

(3 marks)

13. Show the Moore finite state machine for a system that scan for the bits sequences 01111110 in a sting of bits (the sequence is allowed to appear anywhere in a a bit string). This bit sequence is standard used to denote boundaries in serial communication (4 marks)

14. Why is DMA Controller access to main memory in most system given higher priority than CPU access to main memory? (3 marks)

Real-Time Systems CS UC 444
Weightage: 40%
Max. Marks: 40

Date: 09.01.2005
Time: 3 Hrs.
Closed Book

Note: All questions are compulsory. Write any assumption made with its requirement. Symbols have usual meaning.

1. What are called as the special characteristics of a Real-Time Systems (4 marks)
2. What will be Time complexity for the nearest neighbor algorithm to sort all nm tentative assignments of n established trajectories and m measured values in gating? (1 mark)
3. Give the difference between the priority-inheritance and priority-ceiling protocol. (3 mark)
4. Explain the clock-driven multiprocessor schedule with a block diagram? (3marks)
5. Why do you call a periodic static schedule a cyclic schedule? (2 marks)
6. What do you mean by Minimum-Laxity-First algorithm? (3 marks)
7. What do mean by Online and Offline Scheduling? Give example for each. (2 marks)
8. What are the *three* constraints that determine the frame size, explain them. (3 marks)
9. Consider the following four fixed priority tasks:
 $T1 = (3, 1)$, $T2 = (5, 1.5)$, $T3 = (7, 1.25)$, $T4 = (9, 0.5)$. Give the time-demand function $w_4(t)$ of $T4$ and also give the time-demand analysis for the above sets of tasks. (4 marks)
10. Check whether the application given below is *harmonic or not* and calculate the total utilization. (3 marks)

Task	Runtime e_i	Period p_i	Utilization	Priority
T1	3	9	?	?
T2	6	18	?	?
T3	8	36	?	?

11. Show the work flow process definition for the processing of complaints specified in terms of a *Petri net*. The tasks are *register, send-questionnaire, evaluate, process-questionnaire, time-out, process-complaint, check-processing, and archive*. The *transaction processing-ok and processing-not-ok* have to added to the above model to show two possible outcomes of executing task check-processing. (7 marks)
12. Consider a real-time weapon control system aboard an aircraft. Discuss (provide a brief explanation) which of the following events would be considered synchronous and which would be considered asynchronous to the software: (5 marks)
 - i) A 10 millisecond clock interrupts.
 - ii) A divide-by-zero error.
 - iii) A built-in-test software failure.
 - iv) A signal indicating the pilot has pressed the "fire socket" button.
 - v) A signal indicating "low on fuel".
