

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/Backlog), Nov.-Dec. 2016

B. Tech in Computer Science Engineering, Semester VII

Roll No.....

CSE735: REAL TIME SYSTEMS

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
 2. Assume suitable data wherever required and mention it clearly.
 3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.
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Q.1A Objective type multiple choice questions (10 questions @ 1 mark) 10

- i. In real time operating system
 - a) all processes have the same priority; b) a task must be serviced by its deadline period; c) process scheduling can be done only once; d) kernel is not required
- ii. Hard real time operating system has ___ jitter than a soft real time operating system. a) less; b) more; c) equal; d) none of the mentioned
- iii. For real time operating systems, interrupt latency should be a) minimal; b) maximum; c) zero; d) dependent on the scheduling
- iv. In rate monotonic scheduling a) shorter duration job has higher priority; b) longer duration job has higher priority; c) priority does not depend on the duration of the job; d) none of the mentioned
- v. The problem of priority inversion can be solved by a) priority inheritance protocol; b) priority inversion protocol; c) both (a) and (b); d) none of the mentioned
- vi. Time duration required for scheduling dispatcher to stop one process and start another is known as a) process latency; b) dispatch latency; c) execution latency; d) interrupt latency
- vii. Time required to synchronous switch from the context of one thread to the context of another thread is called a) threads fly-back time; b) jitter; c) context switch time; d) none of the mentioned
- viii. Which one of the following is a real time operating system?
 - a) RTLinux; b) VxWorks; c) windows CE; d) all of the mentioned
- ix. Real time systems must have :
 - a) preemptive kernels; b) non preemptive kernels; c) a or b; d) neither a nor b

- x. In a real time system the computer results :
 a) must be produced within a specific deadline period and must be correct; b) may be produced at any time; ; c) may be correct but should be on time; d) must be correct but may be any time
- Q.2 Short answer type questions (4 questions @ 2.5 marks) 10
- a) List the important features that are required to be supported by a RTOS.
 b) Describe an open system? How does an open system compare with a close system?
 c) What is the utilization of CSC Value?
 d) Explain phase of a task in real time system.
- Q.3A What is the difference between a performance constraint and a behavioral constraint in a real - time system? 05
- Q.3B What is a "fail - safe" state? Since safety - critical systems do not have a fail - safe state, how is safety guaranteed? 05
- Q.4A What can be the types of priority inversions that a task might undergo on account of a lower priority task under PCP? 05
- Q.4B How are deadlocks, unbounded priority inversions, and chain blocking prevented using PCP? 05
- Q.5A What are the distinguishing characteristics of periodic, aperiodic and sporadic real time tasks? 05
- Q.5B Explain the important differences between hard, firm and soft real time systems. 05
- Q.6A List the different types of timing constraints that can occur in a real time system? 05
- Q.6B In the following, the partial behavior of a telephone system is given. 05
 If your press the button of a handset for less than 15 sec it connects to a local operator. If you press the button for any duration lasting between 15 to 30 sec it connects to international operator. If you keep button pressed for more than 30 sec, then on releasing it would produce the dial tone. Once the receiver of the handset is lifted the dial tone must be produced within 20 sec, otherwise a beeping sound is produced until the handset is replaced.
- Draw the EFSM model for the telephone system.
 OR
- Q.6B What are the drawbacks in using Unix kernel for developing real time applications? 05
- Q.7A Can we consider EDF as a dynamic priority scheduling algorithm for real time tasks? 05

- 7B Consider the following set of periodic real-time tasks to be scheduled by a cyclic scheduler: T1 ($e_1=1, p_1=4$), T2 ($e_2=2, p_2=5$), T3 ($e_3=5, p_3=20$). Determine a suitable frame size or the task set. 05

OR

- Q.7B What is it required to synchronize the clocks in a distributed real time system? Compare the advantages and disadvantages of centralized and the distributed clock synchronization. 05

- Q.8A • Consider the following set of three periodic real time tasks:
T1: (10,20), T2: (15,60) and T3 (20,120) to be run on a uniprocessor. Determine whether the task is schedulable under RMA. 10
- What is suggested by Liu and Leyland test of RMA Schedulability?
 - List down advantages and disadvantages of RMA.

- Q.9A Consider a real-time system whose task characteristics and dependencies are described in the following table. These tasks repeat every 90 msec. Determine a feasible schedule which could be used by a table-driven scheduler. 10

Task	Computation Time	Deadline	Dependency
T1	10	50	-
T2	10	80	T1
T3	30	60	T1
T4	50	150	T3,T2
T5	35	140	T2

- Q.9B What do you understand by Multiprocessor Task Allocation. Mention its challenges. Explain three Multiprocessor Task Allocation algorithms. The following table shows the execution times (in msec) and periods (in msec) of a set of 10 periodic real-time tasks. Assume that the tasks need to run on a multiprocessor with 4 processors. Allocate the tasks to processors using the next fit algorithm. Assume that the individual processors are to be scheduled using RMA algorithm. 10

Task	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10
e_i	5	7	3	1	10	16	1	3	9	17
p_i	10	21	22	24	30	40	50	55	70	100

OR

- Q.9B What do you understand by temporal data? How are temporal data different from traditional data? Give some examples of temporal data. 10
- Given a temporal data item $d = (10, 2500 \text{ msec}, 100 \text{ msec})$ and the value of current time as 2700 msec. Is the given data item absolutely valid?