(vi) Identify which of these are real-time applications scenarios:
(a) An on-line bus ticketing system
(b) Printing of annual report of a company
(c) Reconciling a day's transactions in an account book of a small company
(d) An aircrafts' yaw control system

(vii) In deadline monotonic scheduling
(a) shorter duration job has higher priorit
(b) longer duration job has higher priority
(c) priority does not depend on the duration of the job
(d) shorter the relative deadline higher the priority

(viii) Maximum number of messages required per CS execution in Maekawa's algorithm is
(a) 3n (b) 5sqrt(n) (c) 2n-1 (d) sqrt(n)

(ix) Satement 1: Lamport's DMX algorithm achieves mutual exclusion.
Statement 2: Maekawa's algorithm does not achieve mutual exclusion.
Which of the above statement is correct?
(a) Statement 1 (b) Statement 2
(c) Both (d) None of these.

(x) In the P-out-of Q request model of deadlock, if P=Q then it becomes
(a) AND (b) OR (c) AND-OR (d) all of these.

Group - B

2. (a) What is the partial ordering and total ordering of event in distributed system?

(b) Briefly discuss about the Lamport's logical clock with an example.

(c) What are the limitations of Lamport's logical clock?

4 + 5 + 3 = 12

3. (a) Consider the following precedence constraints that must be satisfied for the execution of processes P1, P2, P3, P4 and P5:
- P1 can start any time
- P2 can start after P1 completes
- P3 can start after P1 completes
- P4 can start after both P2 and P3 complete

- P5 can start after P3 completes

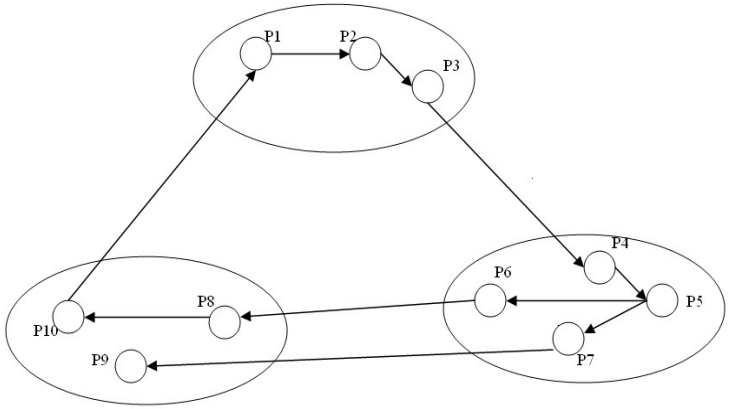
Draw a precedence diagram that captures the above constraints, where a node represents a process and a directed edge from process A to process B means that process B should not start until process A is completed.

(b) There is, one distributed mutual exclusion algorithm, which gives the impression that the message complexity of a distributed mutual exclusion can be $O(\sqrt{N})$ instead of O(N). Why this algorithm needs $3\sqrt{N}$ messages per CS execution? Derive how each request set's size becomes is equal to $\sqrt{N}$.

5 + 7 = 12

Group - C

4. (a) Write the edge chasing distributed deadlock detection algorithm for the AND model. Show the probe message propagation along each edge for the following example and then determine whether any deadlock exists there or not.



(b) Explain with example, if the graph is expedient then KNOT is the sufficient condition for deadlock.

6 + 6= 12

5. (a) Write Sender initiated algorithm for load distributing activity with diagram

(b) What do you mean by load balancing and load sharing.

8 + 4= 12

Group - D

6. (a) Write Read Replication and Full replication algorithm in DSM.

   (b) Explain different types of memory coherence in distributed shared memory.

   (c) Explain two different coherence protocol in DSM

4+6+2 = 12

7. (a) Draw the architecture of the Sun NFS.

   (b) The Sun NFS uses main memory for file cache. What are the issues to be considered in cache management if the virtual memory page can hold a multiple number of file blocks?

   (c) Explain the Coherence Protocol supported in IVY environment. What is the dynamic distributed manager scheme? How is it different from centralized manager scheme?

4 + 4 + 4 = 12

Group - E

8. (a) What do you mean by aperiodic, periodic and sporadic job.

   (b) T1=(4,1),T2=(5,2),T3=(20,5) using RM scheduling draw Gnatt chart for the given set of tasks

   (c) T1=(50,50,25,100), T2=(0,62.5,10,20) and T3=(0,125,25,50)
   Apply DM scheduling to schedule the jobs and find out total utilization.

3 + 4 + 4 + 1 = 12

9. (a) Consider the following set of three periodic real-time tasks: T1=(5,10), T2=(10,30), T3=(20,60) to be run on a uniprocessor. Determine whether the task set is schedulable under RMA.

   (b) Consider the following three periodic real-time tasks to be scheduled using EDF on a uniprocessor: T1 = (e1=10, p1=20), T2 = (e2=5, p2=50), T3 = (e3=10, p3=40). Determine whether the task set is schedulable.

   (c) State difference between RMA and EDF.

6 + 3 + 3 = 12

2016

ADVANCED OPERATING SYSTEM
(CSEN 5202)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following: **10 × 1=10**

   (i) In distributed system a logical clock is assigned with
   (a) each instruction (b) each Processor
   (c) each process (d) none of the mentioned

   (ii) If timestamps of two events are same, then the events are
   (a) concurrent (b) non-concurrent
   (c) nonotonic (d) non-monotonic

   (iii) Which of the following is for global snapshot algorithm?
   (a) Chandy Lamport (b) Lamport's Logical clock
   (c) Ricart- Agarwala (d) None of the above

   (iv) What are the characteristics of a DFS ?
   (a) login transparency and access transparency
   (b) Files need to contain information about their physical location
   (c) both (a) and (b)
   (d) None

   (v) According to the Ricart-Agrawalla algorithm if P1 wants to execute in the critical section and P2 is already executing in the critical section then P2 will reply to the request of P1,
   (a) always (b) if time stamp of P1 < P2
   (c) if time stamp of P1 > P2 (d) when P2 has finished