

7. (a) With diagram explain data access action in distributed file system.
 (b) What is mounting? Explain with diagram.
 (c) What is the role of name server and cache manager in file system?
4 + 4 + 4 = 12

Group - E

8. (a) Consider a system that contains four independent periodic tasks :
 $T_1 = (4, 1)$, $T_2 = (5, 1.8)$, $T_3 = (20, 1)$, $T_4 = (20, 2)$
 Construct a cyclic schedule for the above mentioned four tasks.
 (b) What do you mean by aperiodic, periodic and sporadic jobs?
6 + (2 + 2 + 2) = 12
9. (a) Compare the performances of RM, EDF, LST, FIFO scheduling.
 (b) "When preemption is allowed and jobs do not contend for resources, the EDF algorithm can produce a feasible schedule" - prove it.
 (c) "A system T of independent, preemptable, periodic tasks, with relative deadlines equal to their periods, can be feasibly scheduled on one processor if and only if its total utilization U is at most one" - prove it.
4 + 4 + 4 = 12

**ADVANCED OPERATING SYSTEMS
(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 alternative for the following: **10 × 1=10**
- (i) In distributed system each processor has its own
 (a) local memory (b) clock
 (c) both (a) and (b) (d) none of the mentioned.
- (ii) Two events that are correlated with *happened before relation* are called
 (a) concurrent event (b) causal event
 (c) synchronous event (d) all of these.
- (iii) Network operating system runs on
 (a) server (b) every system in the network
 (c) both (a) and (b) (d) none of the mentioned.
- (iv) Prefix table is associated with
 (a) remote file (b) remote process
 (c) naming (d) broadcasting.
- (v) In distributed file system, when a file's physical storage location changes
 (a) file name need to be changed
 (b) file name need not to be changed
 (c) file's host name need to be changed
 (d) file's local name need to be changed.
- (vi) In which of the following distributed mutual exclusion algorithms, $3(n-1)$ messages are required per CS invocation?
 (a) Ricart-Agrawala's Algorithm (b) Lamport's Algorithm
 (c) Maekawa Algorithm (d) None of these.

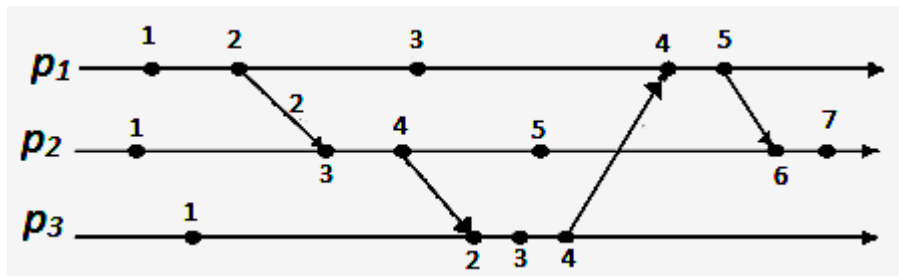
- (vii) Distributed OS works on the _____ principle.
 - (a) file foundation
 - (b) single system image
 - (c) multi system image
 - (d) networking image.
- (viii) In _____ OS, the response time is very critical.
 - (a) multitasking
 - (b) batch
 - (c) online
 - (d) real-time.
- (ix) Phantom deadlock occurs in distributed system only when there is
 - (a) false path
 - (b) false knot
 - (c) false cycle
 - (d) none of these.
- (x) If timestamps of two events are same, then the events are
 - (a) concurrent
 - (b) non-concurrent
 - (c) monotonic
 - (d) non-monotonic.

Group - B

- 2.(a) There is a distributed mutual exclusion algorithm which gives the impression that the message complexity of a distributed mutual exclusion can be $O(\sqrt{N})$ instead of $O(N)$. Write this mutual exclusion algorithm and explain how we can achieve this complexity. Derive $N = K*(K - 1) + 1$ where each request set's size becomes equal to \sqrt{N} .
- (b) How is Suzuki-Kasami's broadcast algorithm different from Ricart-Agrawala's algorithm (in terms of message complexity and synchronization delay)?

(4 + 2 + 2) + 4 = 12

3.(a)



For the above space-time diagram derive the vector clock for each event of each process. The initial value of $C_i = [0,0,0]$ for every process P_i . Assume that the increment value is $d = 1$ for all processes.

- (b) "In a simple solution to distributed mutual exclusion, a *control site* is assigned the task of granting permissions for the CS execution. To request the CS, a site sends a REQUEST message to the control site. The control site queues up the requests for the CS and grants them permission, one by one. This method to achieve mutual exclusion in distributed systems requires only 3 messages per CS execution." Discuss what prompted Lamport to develop the above mutual exclusion solution also, even if it requires more messages $[3(N - 1)]$ per CS invocation.

5 + 7 = 12

Group - C

- 4.(a) Explain the difference between communication deadlock and resource deadlock. What do you mean by phantom deadlock?
- (b) The Chandy-Misra-Haas (CMH) distributed algorithm for deadlock detection uses a wait-for-graph and probe messages. A probe is a triple (i, j, k) denoting that process P_i initiated the deadlock detection and the probe was sent by process P_j 's site to process P_k 's site. With the aid of a small example, explain how the CMH algorithm detects and breaks deadlocks. How might the CMH algorithm be adapted to avoid detecting 'phantom' deadlocks and to avoid re-discovering deadlocks?
- 5.(a) State and explain difference between sender initiated and receiver initiated distributed scheduling algorithm.
- (b) Differentiate load balancing and load sharing . Why pre-emptive task transfer is expensive than non-preemptive task transfer?

6 + 6 = 12

6 + 6 = 12

Group - D

- 6.(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?

3 + 3 + (2 + 2 + 2) = 12