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# MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

*A Constituent Institution of Manipal University*

## VII SEMESTER B.TECH. (INFORMATION TECHNOLOGY/COMPUTER AND COMMUNICATION ENGINEERING) MAKEUP EXAMINATIONS, JAN. 2017

## SUBJECT: PROGRAM ELECTIVE – II: ADVANCED OPERATING SYSTEMS [ICT 415]

**REVISED CREDIT SYSTEM**
**(04/01/2017)**

Time: 3 Hours MAX. MARKS: 50

**Instructions to Candidates:**

- Answer **ANY FIVE FULL** questions.
- Missing data, if any, may be suitably assumed.

**1A.** Differentiate between Lamport's logical clock and vector clock. Write the implementation rules for both. Write the vector clocks for the events defined in Fig.Q.1A

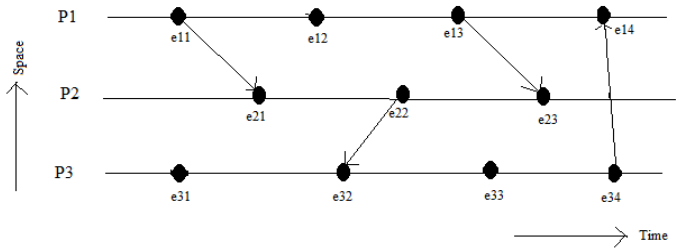


Fig. Q.1A **5**

**1B.** Imagine a 300-server scalable distributed file system that keeps 3 replicas of each data block, in one of two configuration options: (1) each data block is replicated on a random 3 of the 300 servers, (2) the 300 servers are treated as 100 groups, with each data block assigned to one group and replicated across the 3 servers of that group. The second option could be expected to be more reliable, in terms of time to first data loss, since it can tolerate many more failures than the first option (assuming they are in different groups). What would be your most compelling argument for using the first option? Explain your answer. **3**

**1C.** What is a phantom deadlock? Explain with an example. **2**

**2A.** List and explain all the components of a load distribution algorithm. **5**

**2B.** RPC is designed to reduce programmer effort in writing distributed systems by making remote function calls as easy to use as local function calls. Identify three different ways in which this abstraction does not hold true **3**

**2C.** With a flowchart, explain typical data access actions in distributed file system. **2**

**3A.** Explain the Chandy-Misra-Hass's edge-Chasing algorithm for distributed deadlock detection with an example. **5**

**3B.** Specify suitable load sharing algorithms with respect to variation in the load. In which cases, adaptive load distribution algorithm is used? **3**

**3C.** Suppose there are 2 copies of resource A, 3 copies of resource B, and 3 copies of resource C. Suppose further that process 1 holds one unit of resources B and C and is waiting for a unit of A; the process 2 is holding a unit of A and waiting on a unit of B; and the process 3 is holding one unit of A, two units of B, and one unit of C. Draw the resource allocation graph. Is the system in a deadlocked state? Justify your answer. **2**

**4A.** Explain the following with respect to Multiprocessor Operating Systems.
(i) Separate supervisor configuration
(ii) Master-slave configuration
(iii)Symmetric configuration **5**

**4B.** Explain the centralized locking concurrency control algorithm for fully replicated database systems. Discuss various optimizations. **3**

**4C.** Explain two approaches used to design distributed database operating systems with neat block diagrams. **2**

**5A.** Consider two periodic tasks T1 (time=6, period=deadline=10, priority=0) and T2 (time=9, period=deadline=30, priority=1).
(i) With a neat Gantt chart determine whether these two tasks can be scheduled using static priority with pre-emption scheduling. What will be the effect on scheduling, if priority of these two tasks is interchanged? Illustrate with a neat Gantt chart.
(ii) Illustrate the scheduling of these two tasks using pre-emptive earliest-deadline-first and non-pre-emptive earliest-deadline-first scheduling. Lower priority value indicates higher priority. **5**

**5B.** Discuss the implications of the following types of failures on a fault-tolerant system.
(i) Process deaths
(ii) Machine failure
(iii)Network failure **3**

**5C.** Differentiate between consistent and strongly consistent sets. Identify all consistent and all strongly consistent sets shown in the diagram Fig. Q.5C.

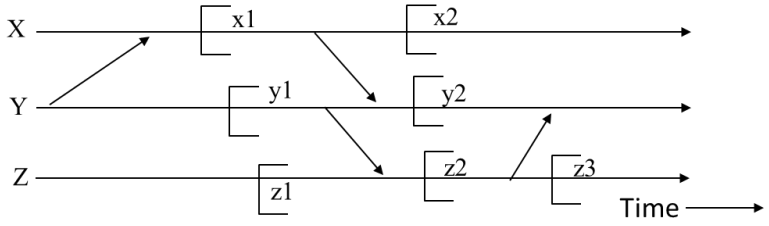


Fig. Q.5C **2**

**6A.** Explain the operation based and state based approach of backward error recovery implementations. **5**

**6B.** Apply Schiper-Eggli-Sandoz (SES) algorithm and assign vector timestamps to each of the events shown in Fig. Q.6B

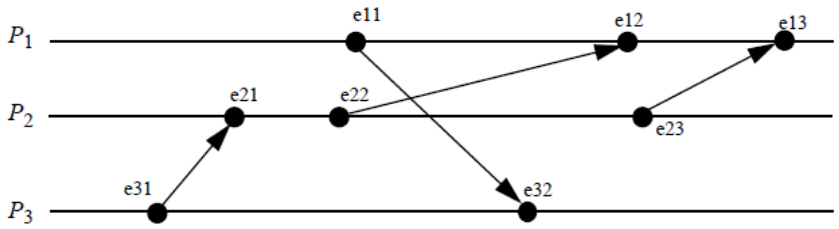


Fig. Q.6B

**3**

**6C.** Consider a distributed file system with four sites S1, S2, and S4 having 1 vote each, and S3 with 2 votes. The corresponding version number of a file "AOS.doc" at each of these sites is 1, 2, 3 and 3 respectively. Assume read quorum, r=2 and write quorum, w=4.

(i) Whether S1 can read file "AOS.doc" if S2 and S3 do not respond? Explain.

(ii) Whether S1 can write to file "AOS.doc", if S3 does not respond? Explain. **2**