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# MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL
*(A constituent unit of MAHE, Manipal)*

## I SEMESTER M.TECH. (COMPUTER NETWORKING AND ENGINEERING)

## END SEMESTER EXAMINATIONS, NOVEMBER 2018

## SUBJECT: ADVANCED OPERATING SYSTEMS [ICT 5104]

**REVISED CREDIT SYSTEM**
**(27/11/2018)**

Time: 3 Hours MAX. MARKS: 50

**Instructions to Candidates:**

- Answer **All** questions.
- Missing data, if any, may be suitably assumed.

**1A.** Write the steps of graph reduction method followed by any unblocked process. Consider a system with 2 copies of resource R1, 1 instance of resource R2, and 1 instance of resource R3. The process 1 holds the resource R3, and is waiting for one instance of resource R1. The process 2 is holding an instance of R1 and waiting for R2. The process 3 is holding R2, and requesting for R3. Draw the resource allocation graph and apply the graph reduction method to determine whether the system is in a deadlock state or not. **5**

**1B.** When concurrent processes or threads interact through shared variable, the integrity of the variable may be violated, if access to variable is not coordinated. Give one solution for the above mentioned problem. State all the requirements needed for the solution. **3**

**1C.** Describe the implementation of semaphores. **2**

**2A.** Apply the Ricart-Agrawala mutual exclusion algorithm by showing the detailed steps for a distributed system with 3 sites as given in Fig.Q.2A. Describe the possible optimization for this algorithm to reduce the number of messages required per critical section execution.

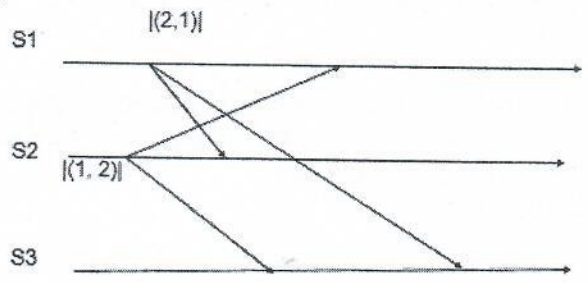


Fig.Q.2A **5**

**2B.** Explain the three general schemes that could be used to make local and remote resources available to users in an effective and transparent manner in the distributed environment. **3**

**2C.** Consider the various events assigned with Lamport logical time stamp shown in Fig.Q.2C. Use the vector clock implementation rules to convert the logical timestamp of all the events. **2**

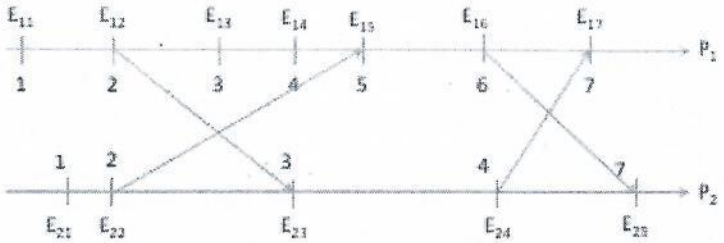

Fig.Q.2C

**3A.** Describe the three control organizations for distributed deadlock detection. Apply edge chasing algorithm for the diagram shown in Fig.Q.3A to detect the distributed deadlock.

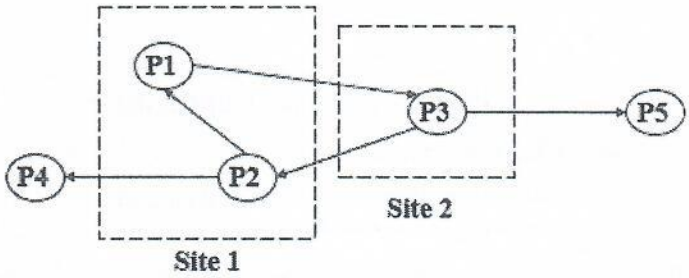


Fig. Q.3A

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**3B.** There can be scenarios where the server crashes while it is executing the RPC call, thus client should be aware of what was the state of the server before it crashed, so that it will know what action to take when the server comes up. Explain the different semantics provided by the RPC system to handle the issue of server crash. 3

**3C.** Write a neat diagram depicting a typical data access action in distributed file system. 2

**4A.** Explain the following for the above-average distributed load scheduling algorithm.
(i) location policy – sender and receiver component
(ii) transfer policy
(iii) information policy 5

**4B.** What is memory coherence? Explain any two distributed shared memory consistency models by giving an example for each. 3

**4C.** Explain the two basic backward error recovery approaches. 2

**5A.** Determine whether the following set of tasks (period, execution time) are schedulable under the rate monotonic and the earliest deadline first algorithm. Determine the CPU utilization of the task sets. Illustrate the answer using a Gantt chart.
(i) (8, 3) (9, 3) (15, 3)
(ii) (8,4) (10, 2) (12, 3) 5

**5B.** Explain the site failures of two-phase commit protocol. 3

**5C.** Write any two possible optimizations to minimize unnecessary waits in centralized locking algorithm for fully replicated database. 2