Reg. No.

प्रज्ञानं ब्रह्म

MANIPAL INSTITUTE OF TECHNOLOGY, MANIPAL 576104

(Constituent College of Manipal University)

FIRST SEMESTER M.TECH (Network Engg.) DEGREE END SEM EXAMINATIONS –NOV 2015

SUBJECT: ADVANCED OPERATING SYSTEMS – ICT 507

(REVISED CREDIT SYSTEM)

TIME: 3 HOURS **26/11/2015** **MAX. MARKS: 50**

Instructions to candidates

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

1A. Apply the Banker's algorithm to check whether the system state given in Fig. Q.1A is safe or not. Show each step clearly. If process p3 requests for one more instance of r4, can the request be granted

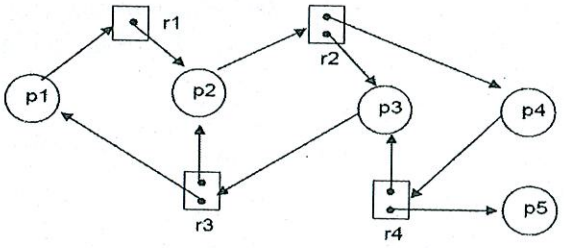

Fig. Q.1A

1B. What are monitors? Describe the structure of a monitor. Solve the readers-writers problem using monitor and explain.

1C. What are the different failure handling semantics in RPC? [5+3+2]

2A. A distributed system consists of three processes given by the diagram shown in Fig. Q.2A. The system uses clocks with initial values of zeros in all entries. Each dot in the diagram represents an event.

i. Show the vector clocks of the sending and receiving events of all the messages without causal ordering of messages.

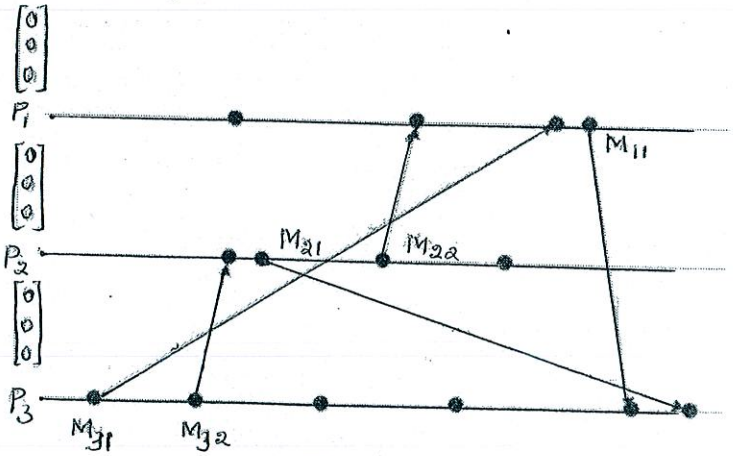

Fig. Q.2A

ii. Give the message pairs whose sending events are causally related based on their timestamps.

iii. Apply the Schiper-Eggli-Sandoz algorithm to the system. You need to show the ordered pairs before and after each message is sent and the vector clock of the receiving process right before the message is being received. For each message's receiving event, use the algorithm to show whether it can be delivered immediately or needs to be buffered. In the latter case (being buffered), show when and why the message can be delivered.

2B. Consider the space-time diagram shown in Fig. Q.2B. Using BSS algorithm, what should be the vector clocks of P1, P2, and P3 at the end? (i.e., after all message exchanges are completed). Order the messages (using the BSS algorithm) before marking the clock values).

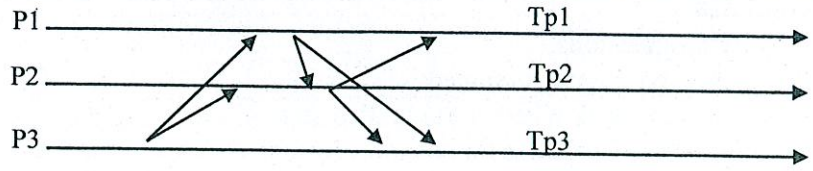

Fig. Q.2B

2C. It is required to update a bank account in order. Which message ordering is appropriate. Why? In the SES protocol for causal ordering of messages, when can a pair (s, t) be deleted from the vector maintained at a site? [5+3+2]

3A. Explain the Diffusion Computation based deadlock detection algorithm. Trace the algorithm considering 3 sites and 10 nodes.

3B. What is the purpose of a REPLY message in Lamport's algorithm? Note that a site need not necessarily return a REPLY message in response to a REQUEST message. State the condition under which a site does not have to return a REPLY message. Also give the new message complexity per critical section execution in this case.

3C. Show that in the Ricart-Agrawala algorithm, the critical section is accessed according to the increasing order of timestamps. Does the same hold true in Maekawa's algorithm? [5+3+2]

4A. Describe the Stable symmetrically initiated algorithm. Discuss the stability of this algorithm. Compare this with stable sender initiated algorithm.

4B. Discuss the various mechanisms for building a Distributed File System.

4C. Explain how the two phase commit protocol handles site failures. [5+3+2]

5A. Write the asynchronous checkpointing algorithm. Trace the algorithm for the processes shown in Fig. Q.5A to determine the consistent set of checkpoints.

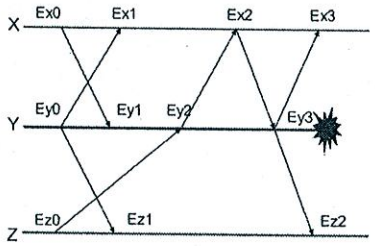

Fig. Q.5A

5B. With illustrations explain the following.
i) Orphan messages ii) Domino effect iii) Lost messages

5C. Two phase locking i ncreases concurrency in transaction execution relative to static locking. However, what problems are associated with two phase locking? [5+3+2]

6A. Distinguish between static table driven scheduling and cyclic executive scheduling. Consider a set of independent periodic tasks $T1 = (4, 1.0)$, $T2 = (5, 1.8)$, $T3 = (20, 1.0)$, $T4 = (20, 2.0)$. Schedule the tasks using structured cyclic executive scheduling.

6B. Discuss the major issues in the design of multiprocessor operating systems.

6C. Why are timestamp based concurrency control algorithms free from deadlock? List basic, multiversion and conservative timestamp ordering algorithms in increasing order of transaction aborts. [5+3+2]