2A. Explain Raymond's tree based algorithm for Distributed Mutual Exclusion. The system shown in Figure Q.2A uses Raymond's tree based algorithm for Distributed Mutual Exclusion. Assume that P0 has the token initially. The requests for token first comes from P3 and then from P2. With diagrams, illustrate how the requests propagate and show the queue contents at each of the nodes until both the nodes complete their critical sections.

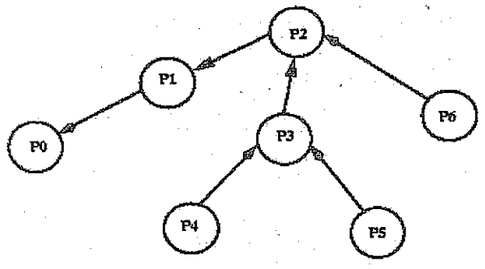

Figure Q.2A 5

2B. Assume a distributed system with three sites S1,S2,S3 all of which are equipped with vector clocks that are initialized to (0,0,0). Consider the following list of events that take place in these sites. Assume that the sites use BSS protocol for causal ordering of messages. Draw the space time diagram and show the clock values.

Event label	Event
E1	S2 broadcasts M2
E2	M1 arrives at S2
E3	M2 arrives at S1
E4	S1 broadcasts M1
E5	M1 arrives at S3
E6	M2 arrives at S3

3

2C. What are the limitations of Lamport's clocks? Illustrate with an example. 2

3A. Write the program for Chandy-Misra-Haas deadlock detection. Apply the algorithm to the system shown in Figure Q.3A to check for deadlock. Assume P1 initiates the deadlock detection.

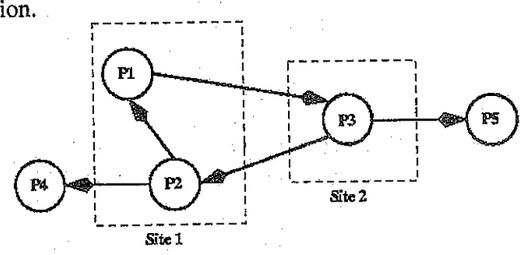

Figure Q.3A 5

3B. Discuss the various design issues in Remote Procedure Call(RPC). 3

3C. Explain the advantages of Distributed Shared memory. 2

4A. Describe the Stable symmetrically initiated algorithm. Is the algorithm stable? Justify. Compare its stability with that of Above-Average algorithm. 5

4B. Explain the static voting algorithm. Discuss how the votes are assigned in static voting algorithm. 3

4C. How are site failures handled in Two-phase commit protocol? Explain. 2

5A. What are the disadvantages of synchronous checkpointing algorithm? Explain the asynchronous checkpointing and recovery scheme. 5

5B. A cyclic real-time scheduler is to be used to schedule three periodic tasks T1, T2, and T3 with the characteristics as given in Table Q.5B. Suggest a suitable frame size that can be used. Show all intermediate steps in your calculations.

Table Q.5B

Task	Phase mSec	Execution Time mSec	Relative Deadline mSec	Period mSec
T_1	0	20	100	100
T_2	0	20	80	80
T_3	0	30	150	150

3

5C. Why are timestamp based concurrency control algorithms free from deadlock? Explain how the reads and writes are performed in Mutiversion Timestamp algorithm. 2

Reg. No.

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

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

END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: ADVANCED OPERATING SYSTEMS [ICT 5104]

REVISED CREDIT SYSTEM
(1/12/2016)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer ALL the questions.
- Missing data if any, may be suitably assumed.

1A. Consider the resource allocation graph of Figure Q.1A.

i. Apply the Bankers deadlock detection algorithm and check whether the system is safe or not. If safe, specify a safe sequence.

ii. If the process p2 requests 2 instances of resource r1, does the system enter a deadlock? Why?

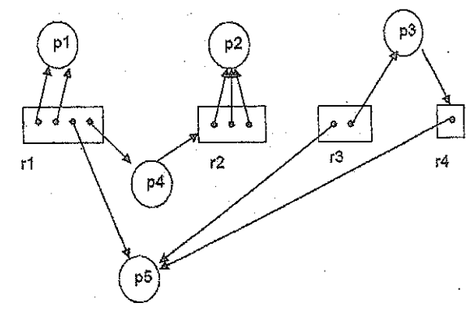

Figure Q.1A 5

1B. Consider the program consisting of 3 concurrent processes and 3 binary semaphores given in Table Q.1B. The semaphores are initialized as S0=1, S1=0, S2=0. Explain how many times will process P0 print '0' under various possibilities.

Table Q.1B

Process P0	Process P1	Process P2

while (true) {
wait (S0);
print (0);
signal (S1);
signal (S2);
}
	wait (S1);
	signal (S0);
		wait (S2);
		signal (S0);

3

1C. What are monitors? How is mutual exclusion achieved using monitors? 2