BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE PILANI

ADVANCED OPERATING SYSTEMS

CS G623

MID TERM EXAMINATION

CLOSED BOOK

MAX MARKS: 25   **TIME: 90 MINUTES**

Ques 1. Three semantics of remote procedure calls have been discussed in class. It is clear by their names regarding the number of executions of remote procedures at remote machines when they are successful. However, the unsuccessful remote procedure calls can lead to unexpected executions at remote machines. Discuss the three call semantics, specifically on possible number of execution of remote procedures at remote machines both when it is successful and unsuccessful.

$$(0.5)X3+0.5 = 2$$

Ques 2. In the time-space diagram depicted below. Apply **Schiper-Eggli-Sandoz** protocol to ensure causal ordering of messages. Clearly depict the vector at appropriate places and at the end.
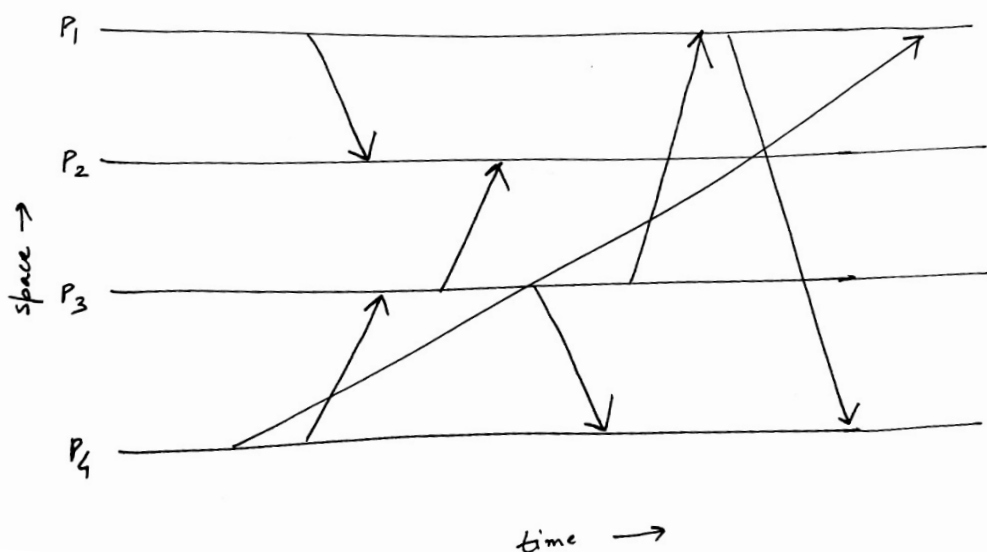
5 marks

Ques 3. There are 5 processes in a system with a shared resource. Process 2 and process 3 wants to access the shared resource. In the Maekwa's algorithm for distributed mutual exclusion, sets have to be formed. As process 6 and 7 are not present, Maekwa *et al.* suggest to replicate processes 4 and 5 for processes 6 and 7 respectively to form the sets. Use **this Maekwa's algorithm**

suggested by authors only to achieve distributed mutual exclusion. In the scenario provided, process 2 has higher priority than process 3. Evaluate the performance of Maekwa's algorithm in terms of number of messages per CS execution and synchronization delay.

4+1 = 5 marks

Ques 4. Consider a network of four processes located at four different sites. At certain stage the state of process is provided as below.

Process 1: waiting for process 2 or process 3

Process 2: waiting for process 4

Process 3: waiting for process 4

Process 4: waiting for process 1

Process 1 initially starts the deadlock detection algorithm. Which algorithm should the system use to detect the deadlock (if it exists)? Show with clear diagrammatic description of steps for deadlock detection in this scenario.

Once the deadlock is detected, what should be done to resolve it? Clearly state your assumptions.

4+1 = 5 marks

Ques 5. An empire having 4 battalions has surrounded a small city to conquer it. In order for attack to be successful, they should attack simultaneously. Out of four battalions, one is traitor and doesn't want the attack to succeed. Assuming all the battalions can communicate orally regarding attack or retreat. One of the battalions (assuming non-faulty) wants to attack and asks other battalions to attack. Can the consensus be reached amongst them? Using one of the algorithms discussed in class, justify your argument with proper steps and diagrams.

3 marks

Ques 6. BITS has currently 10,000 workstations across 4 campuses and wants to develop a distributed file system. In future, BITS wants to increase the strength of students and number of workstations can double within next 5 years. Of the users, some are faculty members who constantly visit foreign universities and want the data to be accessible even in disconnected scenario. How should the file system define the name space and access the files uniquely. In this particular scenario, what caching scheme should be utilized for the distributed file system?

5 marks