

**B.E COMPUTER SCIENCE AND ENGINEERING FOURTH YEAR SECOND
SEMESTER (OLD) - 2017**

DISTRIBUTED COMPUTING

Time: 3 hours

Full Marks: 100

Answer question 1 and any four questions
All questions carry equal marks

1. Answer any ten

10X2=20

- i. What is the difference between distributed computing and distributed system?
 - ii. What is multi-tenant model?
 - iii. Why synchronization is necessary?
 - iv. Discuss the difference between CPU scheduling, Job scheduling and load balancing.
 - v. What is a Single-point-of-failure and how can distribution help here?
 - vi. Explain how a distributed system projects a single system image.
 - vii. What is a proxy? Give an example of where a proxy can be used.
 - viii. What is S3?
 - ix. What component of Globus toolkit is used for high performance data transfer?
 - x. Why are virtual machines suggested in cloud computing systems?
 - xi. What is redundancy and why is it used in a distributed system?
 - xii. How does a client detect a web service? How does it find out about service methods?
2. a) "*A cluster is a type of parallel or distributed processing system*" – Explain with suitable example. Draw a typical architecture of a cluster computing environment and discuss. Name one cluster computing framework and explain its workflow. 4+3+3
- b) What are the different types of services Grid computing environment can accommodate? How multiple administrative domain and autonomy can be handled in Grid. Draw a layered Grid architecture and discuss its components. 2+3+5
3. a) Compare Cloud computing and Grid computing. Discuss some salient features of different cloud service models. How the lack of portability of operating system and software from one machine to another machine is addressed in Cloud. 2+4+4
- b) Explain the difference between full virtualization and para virtualization. Discuss a P2P computing model based on multiple peer relationship (take an example application). Explain how the adhoc communication and collaboration can be established in that application. 4+3+3

4. a) What will you recommend UDP or TCP for video game over network? Justify your answer. Can a process be both a server and a client? - Explain with an example. How can a server identify the client that has called it? How can a server keep track of multiple clients? 4+2+2+2

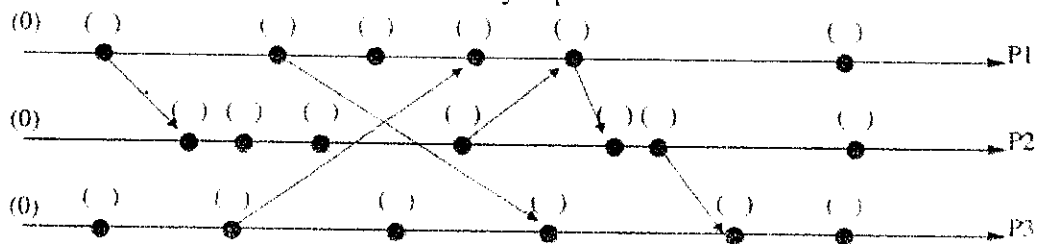
b) Discuss some limitations of RPCs. Explain how they are handled in RMI. Design a mobile agent framework where an agent will move from one node to another for information retrieval in a distributed environment. 2+8

5. a) What problems does data replication introduce? What are the benefits of replication in case of a video distribution service (e.g. YouTube)? What kinds of consistency problems can the use of replication cause? 3+4+3

b) What do consistency models for a shared data store describe? Describe the notion of a monotonic-write consistent store, motivate the need for this notion by means of an example, and illustrate both a monotonic-write consistent data store and a data store that does not provide monotonic-write consistency. 3+7

6. a) What is Lamport's happened-before relation? Explain the difference between causally related events and concurrent events. How does "happens-before" differ (in purpose or application) from total ordering? What advantages does the vector timestamp approach to tracking event ordering have over Lamport's clock algorithm? What disadvantages does it have? 2+2+2+2+2

b) Add the value of a logical clock to each event of the following figure. Use the Lamport's Clock algorithm to compute the values. Using 3 events of the figure (that you must name on the answer sheet), show that event concurrency is not transitive. That is, picking three events e_1 , e_2 and e_3 so that $(e_1 \parallel e_2)$ and $(e_2 \parallel e_3)$ but $(e_1 \not\parallel e_3)$. Justify each of these relations between the events you picked.



10

7. a) Describe the main purpose of MapReduce programming methodology. What types of problems are suitable for this kind of processing? How does MapReduce provide high scalability explain in detail? 3+2+5

b) Describe the general architecture of a distributed object system (e.g. Java RMI). What kinds of issues need to be addressed in such a system if it needs to run on different processors and different operating systems? "*Jini provides mechanisms to enable adding, removing, and locating of devices and services on the network.*" -Explain with the help of different Jini components. 5+5