

**VIT**Vellore Institute of Technology
(Chartered in the University under section 1 of the U.P. Act, 1986)**Final Assessment Test – May 2024**

Course: BITE402L - Distributed Computing

Class NBR(s): 3920/3923/3928

Time: Three Hours

Slot: D2+TD2

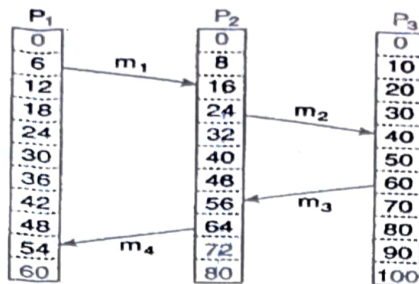
Max. Marks: 100

- KEEPING MOBILE PHONE/ELECTRONIC DEVICES EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE
- DON'T WRITE ANYTHING ON THE QUESTION PAPER

Answer any TEN Questions
(10 X 10 = 100 Marks)

1. Consider a truck hire company and analyze the implementation of a three-tier solution for provisioning the distributed truck hire service. Elucidate the benefits of three-tier client-server architecture considering issues such as performance, scalability, dealing with failure and maintaining the software over time.
2. A request-reply protocol is implemented over a communication service with omission failures to provide at-least-once invocation semantics. In the first case the implementer assumes an asynchronous distributed system. In the second case the implementer assumes that the maximum time for the communication and the execution of a remote method. In what way does the latter assumption simplify the implementation? Exemplify the design choices relevant for the stated scenario and compare the fault tolerant requirements of RR and RRA protocols.
3. Redcap software limited has developed a distributed policy framework that uses RMI as its primary means of communication between JVMs on the same and different hosts. Policies are long lived management agents designed to achieve business objectives. They need to communicate with user interfaces amongst themselves using RMI. Illustrate how to attain the management objectives through RMI architecture and its components.
4. A shopper will transparently invoke a way on a server object. The middleware takes the decision, finding an object that will implement the request, passing it the parameters, invoking its methodology, and returning the results of the invocation. The shopper doesn't need to remember wherever the item is found, its programming language, its software package or the other aspects that don't seem to be a part of the associated object's interface. For the stated scenario describe a suitable middleware based on object request broker architecture to provision a client-server deployment for this scenario.
5. Illustrate how to support client server communication using SOAP and exemplify how to use the HTTP POST method for the request message and its response for the reply message using SOAP. If a request fails in some way, how to convey the fault descriptions in SOAP?
6. How would the clocks in two computers that are linked by a local network be synchronized without reference to an external time source? What factors limit the accuracy of the procedure adopted? How could the clocks in a large number of computers connected by the Internet be synchronized?

7. Consider the three processes as depicted in the below diagram, these processes run on different machines, each with its own clock, running at its own speed. Illustrate how event ordering is attained among these processes, the positioning of Lamport's logical clocks in distributed systems and represent the corrected clocks of the communicating processes.



8. Describe the Xen architecture and outline the distinction between the virtualization approach advocated by Xen and the style of microkernel advocated by the Exokernel project.
9. A file server uses caching, and achieves a hit rate of 80%. File operations in the server cost 5 ms of CPU time when the server finds the requested block in the cache, and take an additional 15 ms of disk I/O time otherwise. Estimate the server's throughput capacity (average requests/sec) if it is "single threaded", "two-threaded, running on a single processor" and what would be the server's throughput capacity if it is "two-threaded, running on a two-processor computer". Also, outline the functionality of name resolution, and scheduling in the case of the UNIX file service.
10. Elucidate simple centralized deadlock detection approach and Analyse how deadlock detection is initiated using edge chasing algorithm and illustrate when to send probe message for deadlock detection in distributed systems with an example.
11. Does NFS provides access transparency? Demonstrate how user programs can issue file operations for local or remote files without any distinction using NFS architecture and list the NFS server operations.
12. Consider the following two transactions T31 and T32. Add lock and unlock instructions to transactions T31 and T32, so that they observe the two-phase locking protocol. Can the execution of these transactions result in a deadlock? What benefit does rigorous two-phase locking provide? How does it compare with other forms of two-phase locking?

T31: read(A); read(B); if A = 0 then B := B + 1; write (B).	T32: read(B); read(A); if B = 0 then A := A + 1; write (A).
--	--

⇔⇔⇔ K/E/TX ⇔⇔⇔