Subject Name: Distributed Computing
Subject Code: 2173208

Faculty: Prof. Hemali Shah

Sr.No.	CHAPTER NO - 1 : Concepts of Distributed Systems:	Marks
	DESCRIPTIVE QUESTIONS	
1.	What is a distributed System? What are the advantages of it? **(May-2018) [L.J.I.E.T]**	7
2.	State any three advantages and disadvantages of distributed systems with respect to centralized systems**. (Nov-2017) [L.J.I.E.T]**	3
3.	Explain issues related to designing of distributed operating system. **(Nov-2018) [L.J.I.E.T] OR** Enlist and explain design issues in distributed systems. **(Dec-2019) [L.J.I.E.T]**	3/7
4.	What are the goal of the building a distributed system? Describe performance of a distributed system. **[L.J.I.E.T]**	7
5.	What is transparency in distributed operating system? Explain any two in detail. **[L.J.I.E.T]**	4
6.	Is it advisable to implement the highest degree of transparency? Justify. **(Nov-2017) [L.J.I.E.T]**	4
7.	What is meant by scalable system? **(Nov-2017) [L.J.I.E.T]**	3
8.	Why is scalability an important feature in the design of a distributed system? Discuss some of the guiding principles for designing a scalable distributed system **[L.J.I.E.T]**	7
9.	Explain how distributed system projects a single system image. **[L.J.I.E.T]**	7
10.	List out issues in designing a distributed operating system and explain transparency in detail. **[L.J.I.E.T]**	7
11.	Differentiate tightly coupled and loosely coupled multiprocessor system. **(Nov-2018) [L.J.I.E.T]**	3
12.	Compare the distributed computing models.**[L.J.I.E.T]**	4
13.	Explain workstation model for building distributed computing system. **[L.J.I.E.T]**	4
14.	Differentiate monolithic kernel model and micro kernel model **[L.J.I.E.T]**	7
15.	Compare the pros and cons of microkernel and monolithic kernel approach. **(Nov-2017) [L.J.I.E.T]**	4
16.	Explain the major differences between Network OS and Distributed OS. **[L.J.I.E.T]**	4
17.	Differentiate between network operating system, multiprocessor time sharing system and distributed operating system**[L.J.I.E.T]**	7
18.	Explain the three tired client-server architecture.**[L.J.I.E.T]**	7
19.	Demonstrate the features of "Google" that covers the Distributed Operating System. **[L.J.I.E.T]**	7
20.	Write a short note on WWW 1.0 **[L.J.I.E.T]**	4
21.	Write a short note on WWW 2.0 **[L.J.I.E.T]**	4
22.	Demonstrate the features of "Google" that covers the Distributed Operating System. **(Nov-2018) [L.J.I.E.T]**	7
23.	Enlist and explain distributed computing models with their advantages and disadvantages. **(Dec-2019) [L.J.I.E.T]**	7
24.	Compare distributed computing and network computing. **(Dec-2019) [L.J.I.E.T]**	3
	CHAPTER NO – 2: Network Communication	
	TOPIC:1 LAN and WAN technologies, OSI Model and Internet protocols	
	DESCRIPTIVE QUESTIONS	
1.	Explain the functionality of each layer in OSI layer architecture with various protocols used in each layer. **(May-2018) [L.J.I.E.T]**	7
2.	Compare TCP and UDP transport protocol.**[L.J.I.E.T]**	4
3.	Explain the application layer protocols of the IP suite **[L.J.I.E.T]**	7
4.	What are the main features of the IP suite of protocols?**[L.J.I.E.T]**	4
5.	Can two computers on the internet have the same IP address? Justify **[L.J.I.E.T]**	3

6.	Network system protocols are unsuitable for distributed systems. Explain.**(Nov-2018)[L.J.I.E.T]**	4
7.	What are protocols? Discuss their significance in a network systems**[L.J.I.E.T]**	7
	TOPIC:2 ATM	
	DESCRIPTIVE QUESTIONS	
1.	Draw the ATM protocol reference model and explain its layer in detail. **[L.J.I.E.T]**	7
2.	Explain in detail about ATM networks with example. **(May-2018) [L.J.I.E.T]**	7
3.	List the Characteristics of ATM technology **[L.J.I.E.T]**	4
4.	Explain the functions of all the layers of the ATM reference model. **(Nov-2017) [L.J.I.E.T]**	7
5.	Compare CBR and VBR traffics in ATM system. **(Nov-2018)[L.J.I.E.T]**	4
6.	Explain any two communication protocol of distributed computing. **(Dec-2019) [L.J.I.E.T]**	4
	TOPIC:3 Protocols for Distributed systems	
	DESCRIPTIVE QUESTIONS	
1.	How does VMTP protocol handle lost messages, flow control, group Communication and maintain transparency **[L.J.I.E.T]**	7
2.	What mechanisms are used by FLIP protocol to take care of group communication, security of messages and easy network management? **[L.J.I.E.T]**	4
3.	Explain FLIP protocol. **[L.J.I.E.T]**	7
	CHAPTER NO -3: Interprocess Communication	
	TOPIC:1 Message Passing and its features, IPC message format, IPC synchronization	
	DESCRIPTIVE QUESTIONS	
1.	Discuss the desirable features of a good message-passing system. **(Nov-2017) [L.J.I.E.T]**	7
2.	Discuss about Blocking versus Nonblocking Primitives. **[L.J.I.E.T]** Compare blocking and non-blocking primitives of IPC. **(Nov-2017) (Nov-2018) (Dec-2019) [L.J.I.E.T]**	3/4
3.	Explain asynchronous point to point message passing with example. **[L.J.I.E.T]**	3
4.	List out desirable features of a good message-passing system. Explain any three. **(Nov-2018) [L.J.I.E.T]**	3
5.	Explain what is message passing. Explain the message passing approaches in distributed computing. **(Dec-2019) [L.J.I.E.T]**	7
	TOPIC:2 Buffering, multi datagram messaging, process addressing techniques, failure handling	
	DESCRIPTIVE QUESTIONS	
1.	What is buffering? Explain different types of buffering in brief. **(Nov-2018) [L.J.I.E.T]**	4
2.	What is datagram? Explain the mechanism of handling multiple datagram in IPC**?[L.J.I.E.T]**	7
3.	What is a datagram? What norms have to be followed in datagram communication**? [L.J.I.E.T]**	4
4.	What is process addressing? Explain commonly used methods for process addressing**. [L.J.I.E.T]**	7
5.	What is non-idempotent routine? How such routine creates problem with message passing? Also explain its solution with example. **(Nov-2018) [L.J.I.E.T]**	7
6.	The operations performed by the server are non-idempotent. Describe a mechanism for implementing exactly-once IPC semantics in this case. **[L.J.I.E.T]**	7
7.	What are the different types of failures and how are they dealt in distributed system? **(May-2018) [L.J.I.E.T]**	7
8.	Discuss failure handling mechanism in IPC. **(Nov-2017) [L.J.I.E.T]**	4
9.	What is acknowledgement message? Why is it always needed for reliable communication? **[L.J.I.E.T]**	4
10.	How does piggybacking reduce network traffic and improve distributed system performance. **(Nov-2017) [L.J.I.E.T]**	4
11.	Explain how timeout mechanism is used to handle failures in IPC? **[L.J.I.E.T]**	7

12.	Explain process addressing techniques. **(Dec-2019) [L.J.I.E.T]**	3
13.	Explain multi datagram messaging. **(Dec-2019) [L.J.I.E.T]**	4
	TOPIC:3 Formal Models for message passing systems	
	DESCRIPTIVE QUESTIONS	
1.	Explain Consistent ordering and Casual ordering in detail in message passing. **[L.J.I.E.T]**	7
2.	Explain the bulleting board semantics for one to many Communications **[L.J.I.E.T]**	7
3.	In group communication, what are the various message ordering schemes? Explain CBCAST scheme. **[L.J.I.E.T]**	7
4.	Explain practical important of CBCAST and ABCAST Protocol with example. **(May-2018) [L.J.I.E.T]**	7
5.	What is ordered message delivery? Discus different types of message ordering. **(Nov-2018) [L.J.I.E.T]**	7
	TOPIC:4 Broadcast and converge cast on a spanning tree, Flooding and building a spanning tree, Constructing a DFS spanning tree with and without a specified root	
	DESCRIPTIVE QUESTIONS	
1.	Explain how to build a spanning tree? **[L.J.I.E.T]**	7
2.	Explain how to construct DFS spanning tree with specified root? **[L.J.I.E.T]**	7
3.	Explain constructing a DFS spanning tree with and without a specified root. **(Dec-2019) [L.J.I.E.T]**	7
	CHAPTER NO -4: Remote Communication	
	TOPIC:1 Introduction, RPC basics, RPC implementation, RPC Communication and Other issues	
	DESCRIPTIVE QUESTIONS	
1.	Explain Remote procedure call (RPC) model. **[L.J.I.E.T]**	7
2.	How is transparency achieved in RPC implementation? **[L.J.I.E.T]**	4
3.	What is Remote Procedure Call? Write the steps for Execute the Remote Procedure Call. **[L.J.I.E.T]**	7
4.	What are the steps to execute RPC? **[L.J.I.E.T]**	7
5.	Explain RPC implementation. Also explain various methods of generating stubs. **(Nov-2018) [L.J.I.E.T]**	7
6.	What is the role of stub in RPC execution? How do stubs make RPC execution transparent? **[L.J.I.E.T]**	7
7.	Discuss various parameter passing semantics. **[L.J.I.E.T]**	7
8.	Explain the importance of marshalling parameters prior to RPC. **(Nov-2017) [L.J.I.E.T]**	3
9.	Explain the following call semantics: (1) Last One (2) At least once **(Nov-2018) [L.J.I.E.T]** (3) Exactly once **(Nov-2018) [L.J.I.E.T]**	3/4/7
10.	Explain orphan call. How are orphan calls handled in the implementation of various call semantics? **[L.J.I.E.T]**	7
11.	Explain communication protocol for RPC. **[L.J.I.E.T]**	7
12.	Distinguish broadcast and multicast RPCs. **[L.J.I.E.T]**	4
13.	What is callback RPC? How does a server handle callback to the client? **[L.J.I.E.T]**	7
14.	Explain Client server Binding Mechanism. **[L.J.I.E.T]**	7
15.	What are the difference between remote procedure call and local procedure call? Explain lightweight RPC in detail. **[L.J.I.E.T]**	7
16.	With the help of an example, write the steps that are needed for the RPC operation. Also explain the RPC semantics in the presence of failures and its implementation issues. **(May-2018) [L.J.I.E.T]**	7
17.	What is the main difference between stateless and stateful servers? Which servers are used in distributed applications? **(Nov-2017) [L.J.I.E.T]**	7

18.	RPCs execute well even in heterogeneous environment. Justify. **[L.J.I.E.T]**	4
19.	Explain RPC either using diagram and theory or using echo client-server program. **(Dec-2019) [L.J.I.E.T]**	7
	TOPIC:2 Sun RPC, RMI basics, RMI Implementation, Java RMI	
1.	What is remote method invocation? What are the commonalities and differences between RPC and RMI? **[L.J.I.E.T]**	7
2.	Explain the significance of RMI in distributed system. **(Nov-2017) [L.J.I.E.T]** What is the significance of RMI in distributed systems? Explain the process of RMI execution **[L.J.I.E.T]**	7
3.	Compare RPC and RMI with example. **(May-2018) (Nov-2018) [L.J.I.E.T]**	7
4.	Explain Java RMI. What are the components and processes of Java RMI execution? **[L.J.I.E.T]**	7
5.	What are the main features of JAVA RMI? **[L.J.I.E.T]**	4
6.	Explain RMI either using diagram and theory or using echo client-server program. **(Dec-2019) [L.J.I.E.T]**	7
	CHAPTER NO -5: Synchronization	
	TOPIC:1 Clock Synchronization	
	DESCRIPTIVE QUESTIONS	
1.	Explain Global averaging distributed algorithm for clock synchronization. **[L.J.I.E.T]**	7
2.	Explain the reasons for drift in the computer clocks. **(Nov-2018) [L.J.I.E.T]**	3/4
3.	What is clock skew? **(Nov-2017) [L.J.I.E.T]**	3
4.	Enumerate the various issues in clock synchronization. Classify the clock synchronization algorithms and explain Berkeley algorithm with an example. **(Nov-2018) [L.J.I.E.T]**	7
5.	Explain an algorithm using multicast and logical clocks for mutual exclusion **[L.J.I.E.T]**	7
6.	What is logical clock? What is its significance in a distributed system? **[L.J.I.E.T]**	3
7.	What is the major difference between physical and logical clocks? **[L.J.I.E.T]**	3
8.	Explain how logical clocks are implemented in distributed systems. **[L.J.I.E.T]**	7
9.	Discuss various techniques used to carry out clock synchronization, taking care of delays and variations in message delays. **(Nov-2017) [L.J.I.E.T]**	7
10.	Enlist and explain the problems with unsynchronized clocks. **(Dec-2019) [L.J.I.E.T]**	3
11.	Explain logical clock in distributed computing using example. **(Dec-2019) [L.J.I.E.T]**	7
12.	Explain the terms global state and local state. Explain any algorithm of global state management. **(Dec-2019) [L.J.I.E.T]**	4
	TOPIC:2 Mutual exclusion	
	DESCRIPTIVE QUESTIONS	
1.	Explain mutual exclusion in centralized approach and decentralized approach. **[L.J.I.E.T]**	7
2.	Why mutual exclusion is more complex in distributed systems? Categorize and compare mutual exclusion algorithms. **[L.J.I.E.T]**	7
3.	Explain the various algorithms available in Mutual Exclusion. **(May-2018) [L.J.I.E.T]**	7
4.	Explain Mutual Exclusion using Distributed Algorithm in Distributed Operating System. **[L.J.I.E.T]**	7
5.	Explain any one mutual exclusion algorithm. **(Dec-2019) [L.J.I.E.T]**	3
6.	Differentiate between mutual exclusion algorithms in centralized system vs. distributed computing. **(Dec-2019) [L.J.I.E.T]**	3
	TOPIC:3 Election Algorithm	
	DESCRIPTIVE QUESTIONS	
1.	Explain the Bully algorithm with example. **(Nov-2018) [L.J.I.E.T]**	4/7
2.	Explain the Token ring algorithm. **[L.J.I.E.T]**	7
3.	Explain the Ring election algorithm. **[L.J.I.E.T]**	7

4.	Compare Bully election and ring election algorithm. **[L.J.I.E.T]**	4
5.	Compare and contrast leader election in rings. **(Dec-2019) [L.J.I.E.T]**	3
	TOPIC:4 Deadlock	
	DESCRIPTIVE QUESTIONS	
1.	What is deadlock? Discuss the necessary and sufficient conditions for a deadlock to occur. **(Nov-2018) [L.J.I.E.T]** Discuss the four necessary and sufficient conditions for a deadlock to occur. Give suitable examples to show that a deadlock cannot occur if any one of the four conditions is absent. **(Nov-2017) [L.J.I.E.T]**	3/4/7
2.	Discuss various dead lock detection algorithms in distributes systems. **(May-2018) [L.J.I.E.T]**	7
3.	Explain the following deadlock prevention techniques: (1) Collective requests (2) Ordered requests **[L.J.I.E.T]**	7
4.	Explain WFG-Based distributed algorithm for deadlock detection. **[L.J.I.E.T]**	7
5.	Explain the probe based distributed algorithm for deadlock detection. **(Nov-2018)[L.J.I.E.T]**	7
6.	Which are the different techniques to avoid deadlock in Distributed Operating System? **[L.J.I.E.T]**	7
7.	Differentiate between deadlocks in distributed systems vs. centralized systems. Explain any deadlock handling algorithm in distributed computing. **(Dec-2019) [L.J.I.E.T]**	7
	NUMERICALS	
1.	A distributed system has for nodes, N1, N2, N3 and N4, each having its own clock. Their clocks tick at500, 550, 580, and 610 times per millisecond, respectively. This distributed system uses an external clock synchronization mechanism in which all four nodes receives the real time every 60 seconds from an external time source to read just their clock. Calculate the maximum clock skew which can occur in the system. **[L.J.I.E.T]**	7
	CHAPTER NO -6: Distributed System Management	
	TOPIC:1 Resource Management , Task management approach, Load balancing approach, Load sharing approach	
	DESCRIPTIVE QUESTIONS	
1.	What are the fundamental issues in resource management in distributed system? **(Nov-2018) [L.J.I.E.T]**	7
2.	Discuss the task assignment approach. What are its basic objectives? **[L.J.I.E.T]**	7
3.	Can you explain how to implement various approach of Task management with example? **(May-2018) [L.J.I.E.T]**	7
4.	Explain the different load estimation policies. **(Nov-2017) [L.J.I.E.T]**	4
5.	What is Load Balancing? Explain any one algorithm of load balancing. **[L.J.I.E.T]**	7
6.	Explain any two issues of load balancing in detail. **[L.J.I.E.T]**	4
7.	Discuss load estimation policy and Process transfer policy in load balancing algorithms. **[L.J.I.E.T]**	7
8.	Discuss the issues in designing load sharing algorithms **[L.J.I.E.T]**	7
9.	Explain resource management in distributed computing. **(Dec-2019) [L.J.I.E.T]**	4
	TOPIC:2 Process Migration	
	DESCRIPTIVE QUESTIONS	
1.	What is process migration? **(Nov-2017) [L.J.I.E.T]**	3
2.	What are the main steps involved in process migration? **(Nov-2017) [L.J.I.E.T]**	7
3.	What are the advantages of process migration? **[L.J.I.E.T]**	7
4.	Explain the address space transfer mechanism for process migration in brief. **[L.J.I.E.T]**	7
5.	What is process migration? Explain process migration in heterogeneous systems. **[L.J.I.E.T]**	7
6.	Explain need of Process migration. Enlist and explain the ways to do it. **(Dec-2019) [L.J.I.E.T]**	4
7.	Enlist and explain how process management is implemented in distributed computing. **(Dec-2019)**	7

	[L.J.I.E.T]	
	TOPIC:3 Threads	
	DESCRIPTIVE QUESTIONS	
1.	What are threads? Differentiate between threads and processes. **[L.J.I.E.T]**	3
2.	List out issues in designing a thread package and explain Threads Scheduling in detail. **[L.J.I.E.T]**	7
3.	What are the different ways of synchronizing threads? Also explain various thread models. **[L.J.I.E.T]**	7
4.	Enumerate the major differences between threads and processes. Discuss thread synchronization. **[L.J.I.E.T]**	4
5.	Discuss various thread models. **(Nov-2017) [L.J.I.E.T]**	4
6.	Discuss thread scheduling algorithm. **[L.J.I.E.T]**	7
7.	Enumerate the major differences between threads and processes. Discuss various thread models. **(Nov-2018) [L.J.I.E.T]**	7
	TOPIC:4 Fault tolerance	
	DESCRIPTIVE QUESTIONS	
1.	Explains various categories of faults. **(Nov-2018) [L.J.I.E.T]**	3/4
2.	Highlight the need for designing fault tolerant system. **[L.J.I.E.T]**	4
3.	Compare active replication and primary backup methods. **[L.J.I.E.T]**	7
4.	How can you create fault tolerance in Distributed computing? Explain in detail with example. **(May-2018) [L.J.I.E.T]**	7
5.	Explain fault tolerance ways in distributed computing. **(Dec-2019) [L.J.I.E.T]**	4
	CHAPTER NO -7: Distributed Shared Memory	
	DESCRIPTIVE QUESTIONS	
1.	Discuss on Design and Implementation issues of Distributed shared Memory**(May-2018) (Nov-2018) [L.J.I.E.T]**	7
2.	Compare message passing and distributed shared memory approaches. **(May-2018) [L.J.I.E.T]**	7
3.	Explain the DSM system architecture. How does granularity affect DSM system performance? **[L.J.I.E.T]**	7
4.	Explain the following two consistency models: (1) Casual consistency model (2) Processor consistency model **[L.J.I.E.T]**	7
5.	Explain 'happened–before' relationship. **(Nov-2017) [L.J.I.E.T]**	4
6.	What is consistency? Discus the various consistency models used in DSM system. **[L.J.I.E.T] OR** What is Consistency Models? Name all Consistency Model. Explain Entry Consistency Model and Release Consistency Model. **[L.J.I.E.T] OR** What is consistency model in shared memory system? Explain strict, sequential and causal consistency model in detail. **[L.J.I.E.T] OR** List and explain various consistency models used in DSM. **(May-2018) [L.J.I.E.T]**	7
7.	What is coherence protocol? Explain how the MRMW protocol is implemented. **[L.J.I.E.T]**	7
8.	Enumerate the various advantages of DSM systems. **(Nov-2017) [L.J.I.E.T]**	7
9.	What is thrashing? Which methods are used to solve the thrashing problems in DSM? **[L.J.I.E.T]**	7
10.	Explain Thrashing and False sharing in Distributed shared memory. **(Nov-2018) [L.J.I.E.T]**	4
11.	Explain thrashing. What are the techniques used to reduce thrashing? **(Nov-2017) [L.J.I.E.T]**	4
12.	What is Thrashing? Explain all algorithms use for data location and DSM consistency management. **(May-2018) [L.J.I.E.T]**	7
13.	Can false sharing be completely eliminated? **[L.J.I.E.T]**	3
14.	Which features of multiprocessor and multi computer systems are combined to build DSM systems? **(Nov-2017) [L.J.I.E.T]**	4
15.	Explain implementation issues of distributed shared memory. **(Dec-2019) [L.J.I.E.T]**	3

16.	Explain thrashing in distributed computing. Enlist and explain the ways to deal with it. **(Dec-2019) [L.J.I.E.T]**	4
	CHAPTER NO -8: Naming	
	TOPIC:1 Overview, Features, Basic concepts, System oriented names, Object locating mechanisms, Issues in designing human oriented names	
	DESCRIPTIVE QUESTIONS	
1.	Write short note on " Object Locating Mechanisms" **[L.J.I.E.T]**	7
2.	What is object location? How is it carried out in a distributed system? Discuss various object-locating mechanisms. **[L.J.I.E.T] OR** Explain practical important of Object locating mechanisms with example. **(May-2018) [L.J.I.E.T]**	7
3.	What are the issues related in designing human oriented names explain in brief. **(Nov-2018) [L.J.I.E.T]**	7
4.	Which are the characteristics features of system oriented name in naming system? **[L.J.I.E.T]**	3
5.	What are the techniques to handle a crash of global identifiers for system-oriented names **[L.J.I.E.T]**	7
6.	Explain object locating mechanisms. Enlist and explain issues in designing human oriented names. **(Dec-2019) [L.J.I.E.T]**	7
	TOPIC:2 Name caches, Naming and security, DNS	
1.	What is Name Cache? What are its types? Explain any one approach to implement it. **[L.J.I.E.T]**	7
2.	Write Short note on : DNS **[L.J.I.E.T]**	7
3.	Discuss the issues involved in name cache design. **(Nov-2017) [L.J.I.E.T]**	7
4.	Explain the DNS name service and bind implementation of DNS. **(May-2018) [L.J.I.E.T]**	7
5.	What is name server? **(Nov-2017) (Nov-2018) [L.J.I.E.T]**	3
6.	What is a name server? What is namespace? Explain the name resolution. **[L.J.I.E.T]**	7
7.	Explain the replication for web hosting system with example. **[L.J.I.E.T]**	7
8.	What is DNS? Name the type of organization of the Given DNS domain name com, edu, org, net, gov, mil, arpa, "xx". **[L.J.I.E.T]?**	7
9.	What is naming system? Explain desirable features of good naming system in brief. **[L.J.I.E.T]**	4
10.	Explain the concept of namespaces. **[L.J.I.E.T]**	3
11.	Compare absolute and relative namespace. **[L.J.I.E.T]**	4