



Roll No.....

CSE601: DISTRIBUTED SYSTEMS

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A Objective type multiple choice questions (10 questions @ 1 mark)

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- i. Checkpoints are a part of
(A) Recovery measures. (B) Security measures.
(C) Concurrency measures. (D) Authorization measures.
- ii. Which of the following is not a consequence of concurrent operations?
(A) Lost update problem. (B) Update anomaly.
(C) Unrepeatable read. (D) Dirty read.
- iii. If a transaction T has obtained an exclusive lock on item Q, then T can
(A) read Q (B) write Q
(C) both read and write Q (D) write Q but not read Q
- iv. Assume transaction A holds a shared lock R. If transaction B also requests for a shared lock on R.
(A) It will result in a deadlock situation.
(B) It will immediately be rejected.
(C) It will immediately be granted.
(D) It will be granted as soon as it is released by A.
- v. A hardened firewall host on an intranet
A. Has a proxy application gateway program running on it
B. Allows specified internet users to access specified services in the intranet
C. Initiates all internet activities requested by clients and monitors them
D. Prevents outsiders from accessing IP addresses within the intranet
- vi. The following ciphertext was received. The plaintext was permuted using permutation (34152) and substitution. Substitute character by character +3 (A → D, etc). The plain text after decryption is: Cipher text :
PDLJDLXHVQC
A. MAIGAIUESNZ
B. IAMAGENIUSZ
C. LDPDJHPLXVZ
D. IAMAGENIUSC
- vii. Using Semaphores, each process has a critical section used to access the
A. Computers
B. Processors
C. Resources
D. Users

viii. Which is an object, acts as a gateway for the client side, all the outgoing requests are routed through it and it resides at the client side and represents the remote object?

- A. Stub
- B. Skeleton
- C. Both A & B
- D. d. None of the above

ix. In RMI Architecture which layer Intercepts method calls made by the client/redirects these calls to a remote RMI service?

- A. Stub & Skeleton Layer
- B. Application Layer
- C. Remote Reference Layer
- D. d. Transport Layer

x. refers to computing technologies in which the hardware and software components are distributed across a network.

- A) Client and Server
- B) User and System
- C) User and file server
- D) User and database server

Q.2 Short answer type questions (4 questions @ 2.5 marks)

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- A List four ways in which an object-based model of computation seems to be a good match for distributed systems.
- B Differentiate between token based and non-token based algorithms.
- C Discuss classification of Agreement problems.
- D Explain SSL & Millicent.

Q.3A Show how 2PL can ensure a conflict-serializable schedule for the same transactions above. Use the notation $Li[A]$ to indicate that transaction i acquires the lock on element A and $Ui[A]$ to indicate that transaction i releases its lock on A .

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Transaction T_0	Transaction T_1
$r_0[A]$	
$w_0[A]$	
	$r_1[A]$
	$r_1[B]$
	c_1
$r_0[B]$	
$w_0[B]$	
c_0	

Q.3B Describe possible occurrences of each of the main types of security threat (threats to processes, threats to communication channels, denial of service) that might occur in the Internet.

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Q.4A Consider the following schedule S of transactions T1, T2, T3, T4. S is conflict serializable or not. Prove.

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T1	T2	T3	T4
Writes(X) Commit	Reads(X) Writes(Y) Reads(Z) Commit	Writes(X) Commit	 Reads(X) Reads(Y) Commit



Q.4B Explain how an RPC system or a remote message send system such as Java RMI might deal with the crash of the server. 05

Q.5A With examples describe Access, Location and Migration transparency in a distributed system. 05

Q.5B When calling a remote procedure or method where a reference parameter is passed, what problems have to be solved and how are they solved? 05

Q.6A What does it mean for two events to be concurrent and what is the relation of the Vector Logic timestamps of the two events. 05

Q.6B Explain with examples the difference between a name server and a directory server. 05

OR

Q.6B What are Client and Server Stubs and how are they used in remote procedure calls? 05

Q.7A Helios (Perihelion Distributed Software) is a micro-kernel operating system for embedded and multiprocessor systems. The operating system is modular in design and can scale from an embedded runtime executive up to a fully distributed operating system. Illustrate. 05

Q.7B Why is the two-phase commit algorithm used in distributed transactions? 05

OR

Q.7B Explain what problems can happen there is no concurrency control where multiple transactions are being executed at the same time. 05

Q.8 Timing is a major issue with the implementation of a distributed system. Each computer in a distributed system must have a concept of time relative to the other computers in the system and an efficient means to convey this time to the system in order to provide synchronization between the processes. There are many factors involved with maintaining time consistency in a distributed system. Investigate the feasibility of timing throughout a distributed system and the various protocols available to implement synchronizing. This could include researching the timing behavior of commonly used programming languages and 10

system. Because timing is very critical with real-time systems, it could naturally include a section on the tools and software available for implementing real-time applications and their approach to timing. Justify with detailed explanation.

Q.9A (a) Define sequential-consistency. Explain with examples what release consistency is.

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(b) Draw Precedence Flow Graph of following set of transactions.

A	W(x)a	W(x)b
B	R(x)a	R(x)b
C	R(x)b	R(x)a

Q.9B (i) Consider the implementation strategies for massively multiplayer online games. In particular, what advantages do you see in adopting a single server approach for representing the state of the multiplayer game? What problems can you identify and how might they be resolved?

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(ii) Give an example of an HTTP URL. List the main components of an HTTP URL, stating how their boundaries are denoted and illustrating each one from your example. To what extent is an HTTP URL location-transparent?

OR

Q.9B (i) Consider a hypothetical car hire company and sketch out a three-tier solution to the provision of their underlying distributed car hire service. Use this to illustrate the benefits and drawbacks of a three-tier solution considering issues such as performance, scalability, dealing with failure and also maintaining the software over time.

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(ii) Consider two communication services for use in asynchronous distributed systems. In service A, messages may be lost, duplicated or delayed and checksums apply only to headers. In service B, messages may be lost, delayed or delivered too fast for the recipient to handle them, but those that are delivered arrive with the correct contents. Describe the classes of failure exhibited by each service. Classify their failures according to their effects on the properties of validity and integrity. Can service B be described as a reliable communication service?