Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (W), Mumbai : 400058, India

(Autonomous College of Affiliated to University of Mumbai)

End Semester Examination

December 2022

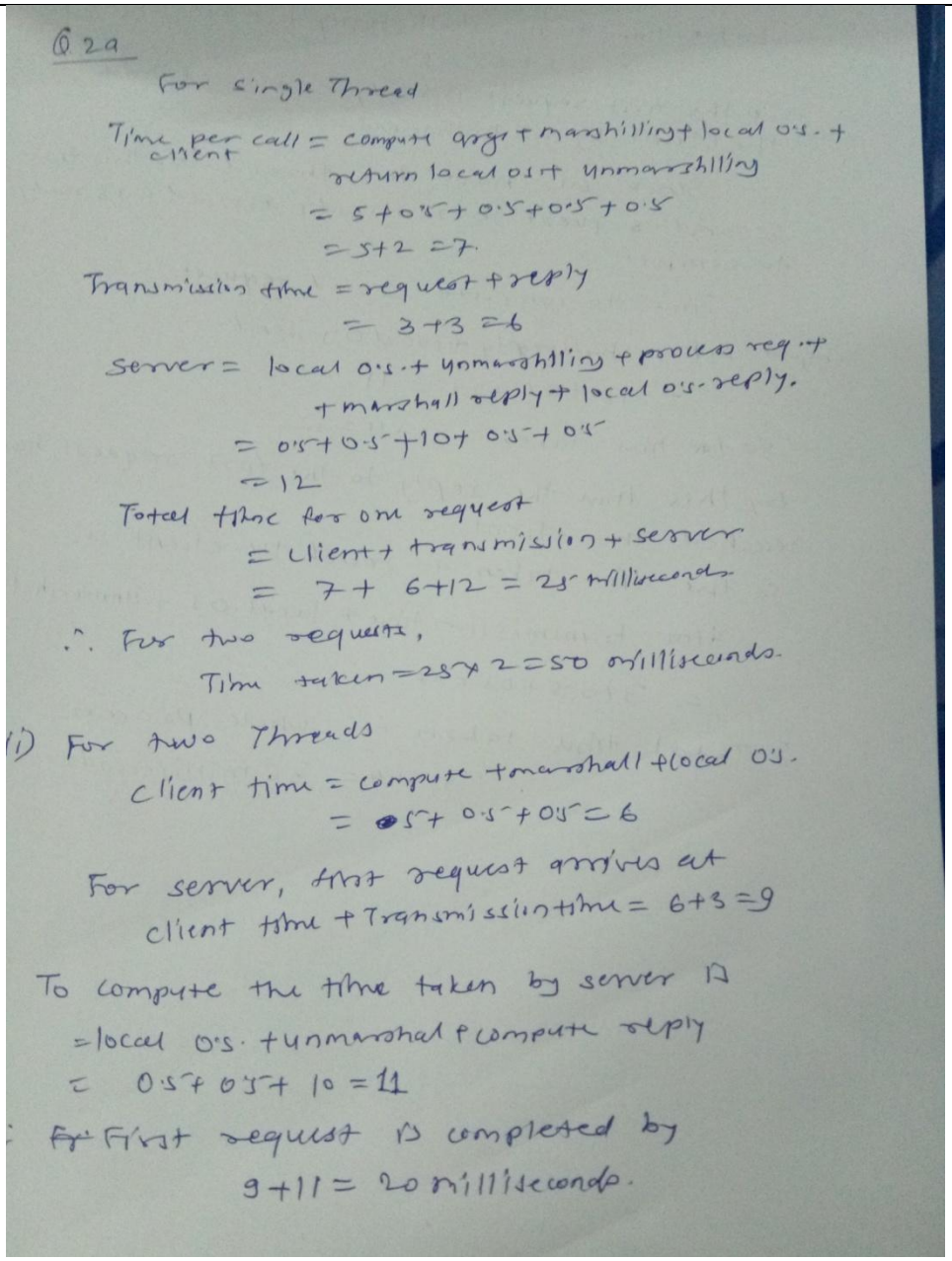
Maxi Marks: 100 Duration: 3 hours

Class:T.Y.Semester:V

Course code: 304Branch:IT, COMP

Name of the course:Distributed Computing

Q No		Max Marks	CO	BL
Q.1 (a)	Identify the various problems of replication. How to improve the performance of distributed application using replication? 3 problems 2 marks Improving performance with example 3 marks	5	3	3
(b)	Compare the Cristian's clock synchronization algorithm and Berkeley's clock synchronization algorithm. 4 comparison 5 marks	5	4	4
(c)	What is RMI? Compare between static and dynamic RMI. RMI definition 1 mark Comparison 4 marks	5	2	4
(d)	Explain the general structure of distributed system as middleware. State the any three services provided by middleware. Middleware diagram 2 marks 3 services 3 marks	5	1	5
Q. 2 (a)	A client makes a remote procedure call to a server. The client takes 5 milliseconds to compute the arguments for each request, and the server takes 10 milliseconds to process each request. The local operating system processing time for each send or receive operation is 0.5 milliseconds, and the network time to transmit each request or reply message is 3 milliseconds. Marshalling or unmarshalling takes 0.5 milliseconds per seconds per message. Evaluate the time taken by the client to generate and return from two requests: i) if it is single threaded and ii) if it has two threads that can make request concurrently on single processor. Ignore the context switching time. i)Single-threaded **5 Marks**	10	2	5



Q 2a

For single Thread

Time per call = compute arg + marshilling + local o.s. + return local o.s + unmarshilling
= 5 + 0.5 + 0.5 + 0.5 + 0.5
= 5 + 2 = 7

Transmission time = request + reply
= 3 + 3 = 6

Server = local o.s. + unmarshilling + process req. + marshall reply + local o.s. reply.
= 0.5 + 0.5 + 10 + 0.5 + 0.5
= 12

Total time for one request
= client + transmission + server
= 7 + 6 + 12 = 25 milliseconds.

∴ For two requests,
Time taken = 25 × 2 = 50 milliseconds.

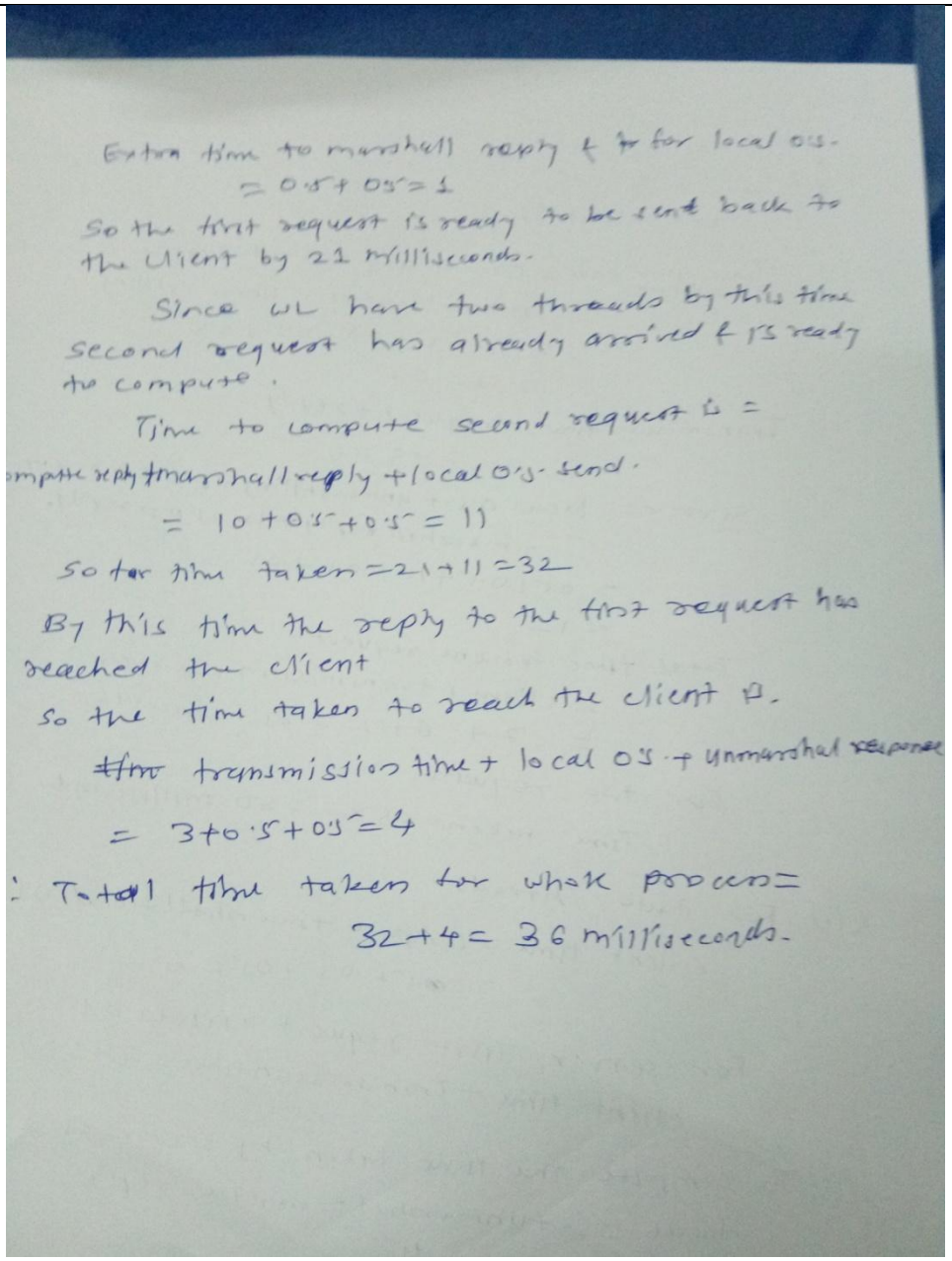
ii) For two Threads
client time = compute + marshall + local o.s.
= 5 + 0.5 + 0.5 = 6

For server, first request arrives at client time + Transmission time = 6 + 3 = 9

To compute the time taken by server
= local o.s. + unmarshal + compute reply
= 0.5 + 0.5 + 10 = 11

∴ First request is completed by
9 + 11 = 20 milliseconds.

(1.b) Two-threaded**5 marks**



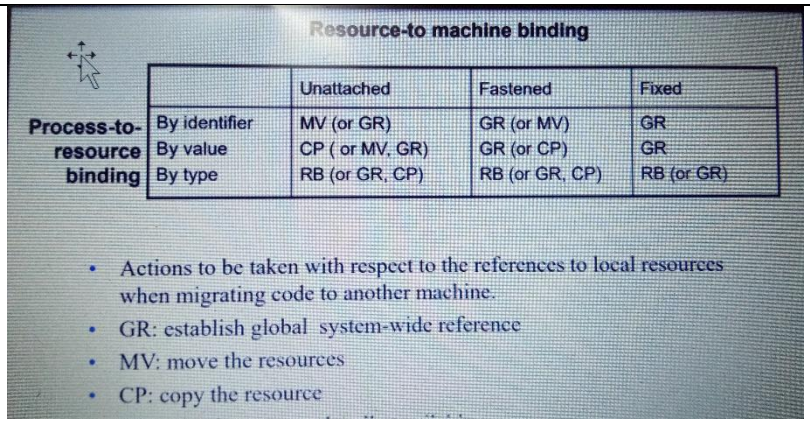
Extra time to marshall reply & for local OS.
= 0.5 + 0.5 = 1
So the first request is ready to be sent back to the client by 21 milliseconds.
Since we have two threads by this time second request has already arrived & is ready to compute.
Time to compute second request is =
compute reply + marshall reply + local OS. send.
= 10 + 0.5 + 0.5 = 11
So far time taken = 21 + 11 = 32
By this time the reply to the first request has reached the client
So the time taken to reach the client is.
transmission time + local OS. + unmarshal response
= 3 + 0.5 + 0.5 = 4
∴ Total time taken for whole process =
32 + 4 = 36 milliseconds.

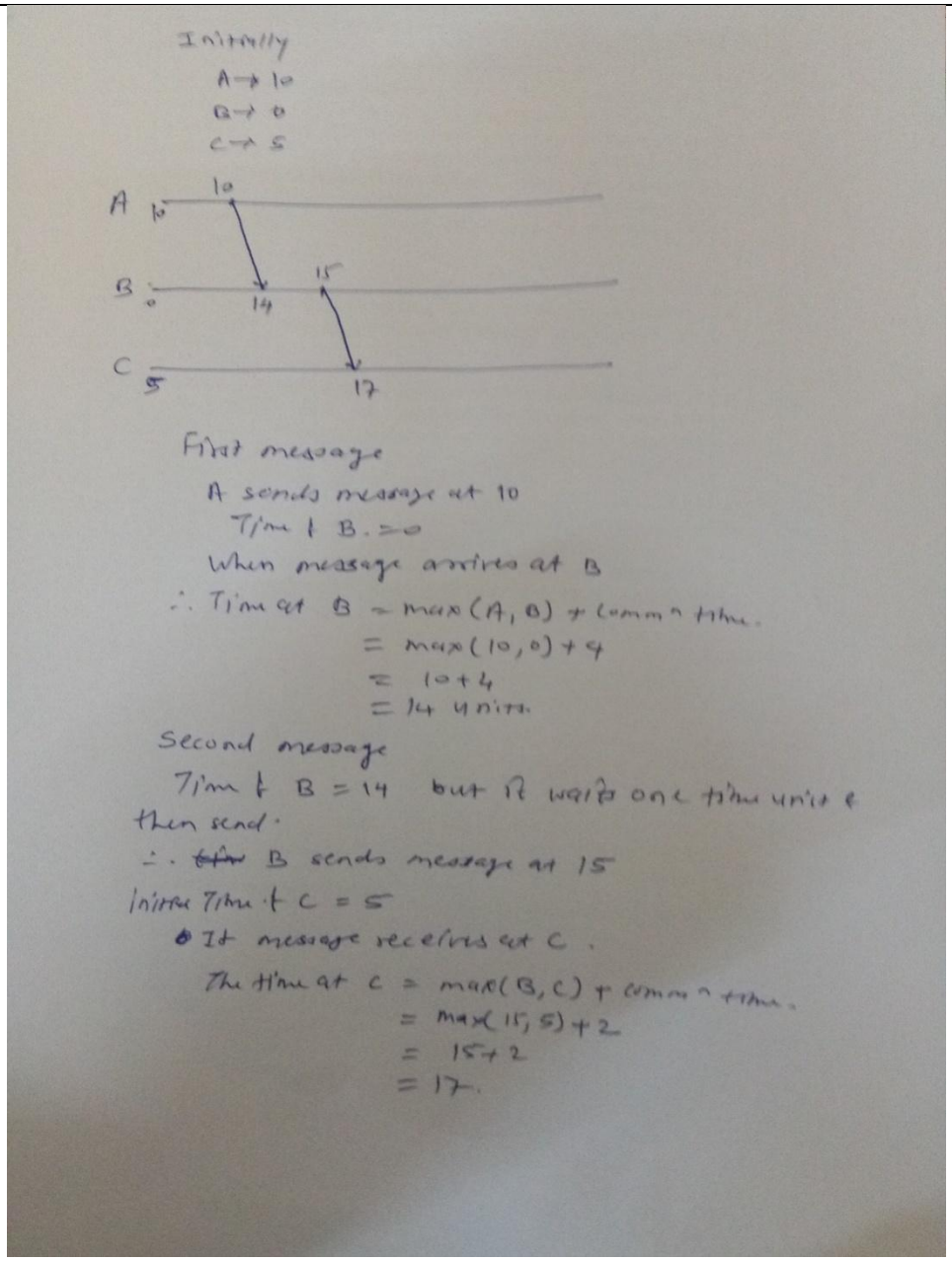
OR

In the client server model implemented using a simple RPC mechanism, after making RPC request, a client keeps waiting until reply is received from the server for its request. It would be more efficient to allow the client to perform other jobs while the server is processing the request. Describe three mechanisms that may be used in this case to allow a client to perform other jobs while the server is processing its request.

Synchronous RPC with diagram 3 marks
Asyncronous RPC with diagram 4 marks
Defered RPC with diagram 3 marks

(b)	What actions to be taken with respect to the references to local resources when migrating the code to another machine? Justify these actions with example.	10	3	5

	 Process to resource binding and resource to machine binding table with actions 4 marks Explanations with example 6 marks			
Q.3 (a)	Suppose there are three processes A, B and C. All clock runs at the same rate but initially A's clock reads 10,b's clock reads 0 and C's reads 5. At time 10 by A's clock, A sends message to B, this message takes 4 units of time to reach B. B then waits one unit of time and then sends a message onto C which takes 2 units of time to reach C. Assuming that the system implements Lamport's timestamps draw a picture illustrating the timestamps for the message and explain how the timestamps are obtained. Diagram 4 marks First message 3 marks Second message 3 marks	10	4	5

				
(b)	What are the reasons of distributed systems are being more popular and useful? Explain any three distributed computing system models with examples. Reasons 1 marks 3 models with diagrams 9 marks (each 3 marks)	10	1	5
Q.4 (a)	Construct with neat diagrams and give example of different forms of communication, such as persistent asynchronous, persistent synchronous, transient asynchronous, receipt based transient synchronous, delivery based transient synchronous, and response based transient synchronous communication. Six diagrams 6 marks Examples 4 marks	10	2	3

(b)	Suppose you have decided to use the high-low policy as the process transfer policy of a load balancing algorithm for distributed system. Select the suitable method that you will use in your implementation for choosing high mark and low mark values. Do these threshold values have to be same for all processors in the system? Give reasons for your answer. Threshold policy for process transfer 6 marks Selecting the threshold 2 marks Reasons 2 marks	10	3	3
Q5. (a)	What is client centric consistency model? The mobile user accessing different replicas of distributed database apply the eventual consistency with respect to this scenario and explain. Client centric consistency model 2 marks Eventual consistency with some scenario 4 marks Explanation 4 marks	10	3	3
(b)	How mutual exclusion algorithm satisfy the requirement of mutual exclusion and starvation using centralized approach and distributed approach? Give the example of centralized mutual exclusion algorithm for 3 processes and one coordinator process showing request, reply,and release messages. How it is advantages to use a timestamp for distributed mutual exclusion? Justify your answer using 4 processes with timestamp for distributed mutual exclusion. Requirement of Mutual exclusion using centralized and distributed approach 2 marks Centralized mutual exclusion diagram with explanation 3 marks distributed mutual exclusion diagram with explanation 3 marks advantages 2 marks	10	4	3