VI SEMESTER B.TECH. (INFORMATION TECHNOLOGY),

GRADE IMPROVEMENT/MAKE-UP EXAMINATIONS, AUGUST 2021

SUBJECT: DISTRIBUTED SYSTEMS [ICT 3254]

REVISED CREDIT SYSTEM (05/08/2021)

Time: 2 Hours

MAX. MARKS: 40

Instructions to Candidates:

✤ Answer ANY FOUR FULL questions.

✤ Missing data, if any, may be suitably assumed.

1A.	Explain in detail about the architectural model of distributed system.	5
1B.	Justify the statement "Interface Definition Languages are used by client for accessing the web services." with suitable example. Consider a scenario in a asynchronous distributed systems, there are two communication services X and Y. In service X, messages may be lost, duplicated or delayed and checksums apply only to headers. In service Y, messages may be lost, delayed or delivered too fast for the recipient to handle them, but those that are delivered arrive order and with the correct contents. Discuss the classes of failure experienced by each of these services and which one these can be reliable? Why?	5
2A.	Discuss Remote Procedure Call (RPC) semantics with suitable examples.	5
2B.	Briefly explain server-less file system approach for designing distributed file system. Consider a scenario where user can access the data provided by remote server regardless of their location. Briefly explain the type of computing used with an example.	5
3A.	Write two separate java programs (one for server and other for client) using socket APIs for TCP and UDP, to implement the File Server. The client program will send the name of the text file to the server. If the file is present at the server side, the server should send the contents of the file to the client along with the file size, number of alphabets number of lines, number of spaces, number of digits, and number of other characters present in the text file to the client. If the file is not present, then the server should send the proper message to the client. Note that the results are always displayed at the client side. Client should continue to send the filenames until the user enters the string 'stop'.	5
3B.	 Justify your answer for the following two scenarios: A) There are three events a, b, and c, no two events belong to the same process. Prove or disprove the following with the help of a diagrammatic example. i) a is concurrent with b and b is before c implies that a is before c. ii) a is concurrent with b and b is concurrent with c implies that a is concurrent with c. B) Explain with an example causal consistency model. Consider the following situation: 	

	Process P1	Proc	ess P2	Process	P3			
	x=1; print(y, z);	y = 1 print	; t(x, z);	z = 1; print(x.	v):			
	$\mathbf{p}(\mathbf{m}(x, z), \mathbf{p}(\mathbf{m}(x, z), \mathbf{p}(\mathbf{m}(x, y)))$							
	The output belongs to {000000, 111111} in two executions. Explain which of these							
	pattern represents the execution order that comply to the sequential consistency						5	
	model?							
4 A.	Explain with suitable illustrations pr	imary	based an	nd rep	licated	write consistency		
	protocols.						5	
4R	The host computers used in peer-to-pe	er syst	ems are d	often s	simply	leskton computers		
Ъ.	in user's office or homes. What are the	he imn	lications	of the	is for th	e availability and		
	security of any shared data objects that they hold and to what extent can any							
	weaknesses be overcome through the u	use of r	replication	on?				
			1					
	For the given replica's, in Fig.Q4B, c	conside	ring <4 ,	B > ar	nd <12,	A> as committed		
	operations, find the values for the follo	owing a	along wi	th step	os:			
	i) Ordering Devia	tion at	A & B					
	ii) Numeric deviati	ion at A	A & B					
	iii) Vector Time sta	amps af	fter the e	xecuti	ons			
	Replica A		Repl	ica B				
	Conit: x=5;y=7		Conit: x=	=3;y=5				
	Operation	Result	Operatio	on	Result			
	<4,B> x=x+2	x=2	<4,B> x=	x+2	x=2			
	<5,A> x=x+3	x=5	<7,B> y=	y+3	y=3			
	<7,B> y=y+3	y=3	<12,A> y	/=y+1	y=4			
	<12,A> y=y+1	y=4						
	10,77 9-912	Fire (ם <i>ו</i> ער 140				5	
5 1	Consider Fig 05^{1} and explain the y	Fig.($\frac{24B}{100}$	ndy I	amport	Global Snanshot		
JA.	Algorithm by showing the state information of processes P1 P2 P3 and channels							
	Argonum by showing the state information of processes 1 1,1 2, 1 5 and chamlers.							
			ji la					
	m1 *		2					
	P2							
	• Red star indicates local state is saved							
	P3							
	*							
	Fig.O5A							
5 B .	Consider the following Fig.Q5B for processes P1, P2 and P3 executing in a							
	distributed system. Compute the vector timestamp for each event.							
	P1:							
	Fig.Q5B							

	 For the given sequential processes P1, P2 and P3, calculate X', Y'& Z' values for the following execution sequence: i) 1-4-7-2-5-8-3-6-9, Is the execution sequence consistent? Justify. ii) 1-2-4-5-7-3-9-6-8, Is the execution sequence consistent? Justify. 						
	Sequential concurrent processes: P1, P2 and P3						
	Shared variables: X, Y & Z (initially X=0, Y=8, Z=12)						
	P1 P2 P3						
	1.Store 4,(X) (X=4) 4.Load R2,(Y) 7.Load R3 (Z)						
	2.Load R1, (X) 5.Store R2,(Y'=Y) 8.Store R3,(Z'=Z+4)	5					
	3. Store R1, (X')(X'=X) 6. Store 20, (Z) (Z=20) 9. Store 22, (Y)						
	 i) A request-reply protocol is implemented over a communication service with omission failures to provide at-least-once RMI 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 is T. In what way does the latter assumption simplify the implementation? ii) A service implemented by several servers. Explain why resources might be transferred between them. Would it be satisfactory for clients to multicast all 						
	requests to the group of servers as a way of achieving mobility transparency for clients?						
6B.	Discuss the challenges faced for each of the following scenarios:						
	i) Health care management system by adopting distributed environment.						
	ii) A simpler version of the distributed garbage collection algorithm just invokes $addRef at$ the site where a remote object lives whenever a proxy is created and $removeRef$ whenever a proxy is deleted. Outline all the possible effects of						
	communication and process failures on the algorithm.						