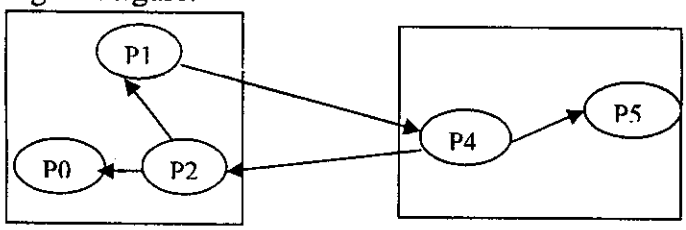
EX/IT/T/421/2018

BE Information Technology 4th Year 2nd Semester Examination – 2018

Subject: **Distributed System & Applications**

Time : Three hours **Full Marks: 100**

Different parts of the same question should be answered together.

CO1 [20]	Answer any one from (a) and (b) in this block Q.1(a) i) In many distributed systems, resource sharing is a major goal. Provide examples of distributed systems, where the shared resource is (i) a disk (ii) network bandwidth and (iii) a processor. ii) Prove that for a system having only one unit of each resource type the presence of a cycle in a resource allocation graph is both a necessary and a sufficient condition for the existence of deadlock. iii) Why is the deadlock avoidance strategy never used in distributed systems for handling deadlocks? iv) Show that in the AND model false deadlocks can occur due to deadlock resolution in distributed systems. Can something be done about it or they are bound to happen? v) What is the difference between synchronous and asynchronous DS? 3+5+3+6+3 =20 Q.1(b) i) What is a knot ? ii) Write a pseudo code for Probe-based distributed algorithm for deadlock detection in a distributed system. iii) What are the main advantages of this algorithm over a WFG based distributed algorithm ? iv) Complete the diagram given below by labeling the probes correctly. Illustrate the steps of CMH algorithm using the given figure.  v) In what respect are distributed computing systems better than parallel computing systems? 3+5+4+6+2=20
CO2 [20]	Q.2 i) High level name servers in DNS that are close to the root , generally do not support recursive name resolution. Explain why? ii) Is the URL http://www.cs.vu.nl/ location independent? Explain iii) Justify whether caching can play a better role in recursive name resolution than iterative name resolution. iv) Briefly describe the process of File mounting system. v) How many lookup calls are necessary to resolve a 5 part pathname. What is the reason for performing translation step by step. 5+3+4+4+4=20
CO3 [30]	Q.3 i) Mention the subsystems of Global Transaction Manager (GTM). ii) With a neat diagram describe the steps of distributed query execution policy. iii) How does 2PC handles following issues in case of distributed transaction commits • What if resource manager RMi at site i fails after a transaction commits at RM_k at site k • What if other resource managers are down when RMi recovers? • What if a transaction thinks a resource manager failed and therefore aborted, when it actually is still running?

	iv) What is the significance of 3PC? Does it have any disadvantage? v) Discuss the significance of three orthogonal dimensions of a distributed database. vi) Give three correctness rules for fragmentation. 6+5+6+5+4+4=30
CO4 [20]	Answer any one from (a) and (b) in this block Q.4(a) i) No fault-tolerant system can be implemented without some form of redundancy. The redundancy could be in spare hardware, or extra space or extra time used in the implementation of the system. Examine various cases and argue why this is true. ii) If the communication channels are non-FIFO, and the message propagation delays are arbitrarily large, then using bounded sequence numbers, is it possible to design a window protocol that can withstand the loss, duplication and reordering of messages. iii) Can the model of triple modular redundancy handle Byzantine failures? Give an example of Byzantine failure? iv) What do you mean by a F-Tolerant system? 5+5+7+3=20 Q.4(b) i) Illustrate with example what do you mean by forward error recovery? ii) Show that having three processes of which one is faulty, is not enough to guarantee agreement between the two nonfaulty ones in a Byzantine setting. iii) Give an example in which masking an omission failure leads to a performance failure ? iv) What do you mean by graceful degradation of a system ? 5+5+5+5 =20
CO5 [10]	Q.5 i) Describe several forms of *file sharing semantics* in distributed file systems, and explain why these semantics are so important when it comes to implementing distributed file systems. ii) Name a few disadvantages of a distributed file system in which the server invalidates client caches. 5+5 =10

CO1: Recollect Distributed Systems preliminaries, Distributed Communication Protocols and Fundamental Algorithms (K2, A2)

CO2: Illustrate and sketch different Name services and relate them in case study of Global Name Service (K3, A3)

CO3: Analyze, compare different Distributed Database handling issues like transaction, Concurrency, Consistency and Replication protocols (K4, A3)

CO4: Describe and analyze the concept of Fault Tolerance in Distributed Systems and compare different Failure Detection and Stabilization mechanisms; (K4, A3)

CO5: Analyze, compare and distinguish different Distributed File Systems (K4, A3)