Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII (OLD) - EXAMINATION – SUMMER 2017

Subject Code:180702 **Date:29/04/2017**

Subject Name: Parallel Processing

Time:10:30 AM to 01:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Briefly explain Superscalar architecture. Which are the major problems in designing Superscalar architecture? Compare Superscalar architecture with Very Long Instruction Word (VLIW) Processors.	**07**
	(b)	Briefly explain NUMA and UMA computers. Briefly explain state diagram of simple three state coherence protocol. Also explain Snoopy and Directory based cache coherence mechanism	**07**
Q.2	**(a)**	Draw Omega network connecting eight inputs and eight outputs. With diagram show the routing of processor five (101) with memory bank three (011). What is the connection cost in this network? Is this network is blocking or non blocking? Justify your answer.	**07**
	(b)	Define Decomposition, Granularity, maximum degree of concurrency and average degree of concurrency. With example explain determination of average degree of concurrency with the help of task dependency graph	**07**
		OR	
	(b)	Briefly explain following Decomposition techniques 1. Data Decomposition 2. Speculative Decomposition 3. Exploratory decomposition	**07**
Q.3	**(a)**	Briefly explain scatter and gather communication operations on eight node hypercube. What is the difference between scatter and broadcast operation? Find out the time required to carry out scatter operation on eight node hypercube.	**07**
	(b)	Briefly explain the difference between all to all broadcast and all to all personalized communication. With diagram explain all to all broadcast on 3X3 mesh With diagram explain optimal algorithm of all to all personalized communication on three dimensional 8-node hypercube.	**07**
		OR	
Q.3	**(a)**	With block diagram explain the possible implementation of **Send** and **Receive** primitives in message passing interface. Mention the advantages and disadvantages of each implementation.	**07**
	(b)	Briefly explain all-reduce and prefix-sum operations. Briefly explain their implementation on an eight node hypercube using communication pattern similar to used in all to all broad cast operation.	**07**
Q.4	**(a)**	Define speedup and efficiency related to parallel system. If a problem of size W has a serial component Ws, prove that W/Ws is an upper bound on its speedup, no matter how many processing elements are used.	**07**

	(b)	What is the usefulness of isoefficiency function? Derive equation of isoefficiency function Find isoefficiency function if $W=n^3$ $To=2p\sqrt{p}t_s + 2pt_w n^2/\sqrt{p}$	**07**

OR

Q.4	**(a)**	Define cost of parallel system. What is the condition of cost optimal system? Explain parallel algorithm of adding n numbers. Derive condition to make this algorithm cost optimal	**07**
	(b)	Briefly explain pthread_create, pthread_join and pthread_exit functions related to thread. Explain attributes associated with threads and mutex. Briefly explain different types of mutex	**07**
Q.5	**(a)**	Briefly explain Cannon's matrix-matrix multiplication algorithm. Find parallel execution time of this algorithm. What is the cost-optimal condition for this algorithm?	**07**
	(b)	Briefly explain parallel version of Quick sort algorithm for shared address space system. Sort following numbers using parallel version of Quick sort considering three processes 3 2 1 5 8 4 3 7 9	**07**

OR

Q.5	**(a)**	Briefly explain parallel version of Prim's minimum spanning tree algorithm. Find parallel run time of this algorithm. Also find speedup and efficiency of this algorithm	**07**
	(b)	Briefly explain Bitonic sort. What is the parallel run time of this algorithm? Sort following numbers suing Bitonic sort 10 20 5 9 3 8 12 14 90 0 60 40 23 35 95 18	**07**

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