BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION)

CLASS: BE **SEMESTER: VII**
BRANCH: IT **SESSION : MO/2018**

SUBJECT : IT7041 PARALLEL AND DISTRIBUTED COMPUTING

TIME: 1.5 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. The total marks of the questions are 30.
2. Candidates may attempt for all 30 marks.
3. In those cases where the marks obtained exceed 25 marks, the excess will be ignored.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. The missing data, if any, may be assumed suitably.

Q1 (a) Explain the need of parallel processing. [2]
(b) Compare data parallelism with control parallelism. [3]

Q2 (a) Given a task that can be divided into m subtasks, each requiring 2 units of time, how much time is required for an m-stage pipeline to process n tasks? [2]
(b) Prove that if $(1/k)^{th}$ of the time spent executing an algorithm involves operations that must be performed sequentially, then an upper limit on the speedup achievable by executing the algorithm on parallel processors is k. [3]

Q3 (a) Enumerate the features of various PRAM models of computation. [2]
(b) Given a CREW PRAM algorithm with time complexity $O(t(n))$, what is an upper bound on the time complexity of an algorithm to solve the same problem on the EREW model? [3]

Q4 (a) Define the problem of prefix computation. How can prefix computation help in compaction? Explain with an example. [2]
(b) Given two sorted arrays with $n/2$ disjoint values, how will you merge them using CREW PRAM model? Present an algorithm to achieve the goal. [3]

Q5 (a) Prove that a binomial tree of height n has a dilation $\lceil n/2 \rceil$ embedding in a 2-D mesh. [2]
(b) Prove that a complete binary tree of height more than 4 cannot be embedded in a 2-D mesh without increasing the dilation beyond 1. [3]

Q6 Given a set of tasks T = {T_1, T_2, T_3, T_4, T_5, T_6 T_7, T_8 , T_9} with their execution time 3, 2, 2, 2, 4, 4, 4, 4 and 9 units respectively, The dependency of tasks are as follows: Task T_9 cannot be started until T_1 is finished, tasks T_5, T_6 T_7, T_8 can be started only when task T_4 is over. Schedule these tasks using Graham's List scheduling algorithm for 3 and 4 concurrent processors. Compare and comment on the result obtained. [5]

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