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

**CLASS: BE** **SEMESTER: VII**
**BRANCH: IT** **SESSION : MO/2019**

**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.

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Q1 (a) Define parallel processing and parallel computer. [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]

Q2 (a) Given a task that can be divided into $m$ subtasks, each requiring 1 unit of time, how much time is required for an $m$-stage pipeline to process $n$ tasks? [2]
(b) A sequential implementation of the Sieve of Eratosthenes marks about 2.2 million cells in order to compute all primes less than 1 million. Estimate the maximum speedup achievable by the control-parallel version of the Sieve of Eratosthenes as it finds all primes less than 1 million. [3]

Q3 (a) Summarize the similarities and differences between RAM model of serial computation and PRAM model of parallel computation. [2]
(b) Prove that a $p$-processor PRIORITY PRAM can be simulated by a $p$-processor EREW PRAM with the time complexity increased by a factor of $\Theta(\log p)$. [3]

Q4 (a) Given a one-way linked list with 15 nodes, each containing either 0 or 1, if suffix sum is to be performed on it to rank the nodes, how many processors will be required? Estimate the number of iteration that each of these processors will undergo while completing the task. [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) What do you mean by embedding of a graph, dilation of embedding and load of an embedding? [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 (a) How can be a set of active concurrent processes be deadlocked? Elaboarate. [2]
(b) Discuss the approaches of various class of algorithms to address the problem of dynamic load balancing on multicomputers. [3]

**:::: 23/09/2019M ::::::**