Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058, India

(Autonomous College Affiliated to University of Mumbai)

Mid Semester Examination-Synoptic

2018-19

Max. Marks: 20

Class: M.Tech. (1st Year)

Course Code: CE922

Name of the Course: High Performance Computing

Duration: 60 Min

Semester: II

Branch: Computer Engineering

Instruction:
  (1) All questions are compulsory
  (2) Draw neat diagrams
  (3) Assume suitable data if necessary

Q No.	Question	Max. Marks	CO
Q.1	Exemplify Latency (L), Asymptotic Bandwidth (B), Throughput (T) and end-to-end Delay (D) for evaluation of Communication Performance in High Performance Computing System. **Answer:** Four definitions carry 4 marks. Four examples of the four definitions carry 1 mark.	05	CO2
Q.2	Illustrate an implementation of send-receive messaging protocol for large messages using Active Messages Programming Model. **Answer:** Explanation of Sender Process carries 1 mark. Explanation of Receiver Process carries 1 mark. Working of Send-Receive Protocol along with the details of variables carries 3 marks.	05	CO1
Q.3	Find and Justify the values of Node degree, Network diameter, Number of links, Bisection width and Symmetry for 2D–Mesh, if $N > 0$ is the number of nodes of 2D–Mesh and is a perfect square. **Answer:** Each valid justification and value carries 1 mark. Five valid justifications and values carry 5 marks.	05	CO2
Q.4	Let $O(n)$ be the total number of unit operations performed by an n-processor system and $T(n)$ be the execution time in unit time steps. Prove that $1/n \leq E(n) \leq U(n) \leq 1$ using the relations among Speedup $S(n)$, Efficiency $E(n)$, Quality $Q(n)$, Utilization $U(n)$ and Redundancy $R(n)$ of a parallel computation. **Answer:** Proof of left inequality carries 2 marks. Proof of right inequality carries 2 marks. Proof of relation between Left and Right inequality carries 1 mark.	05	CO1

OR

	05	CO1

Give a hypercube algorithm to compute prefix sums of n numbers if p is the number of nodes and n/p is an integer greater than 1. Assuming that it takes time t_{add} to add two numbers and time t_s to send a message of unit length between two directly-connected nodes, give an exact expression for the total time taken by the algorithm such that t_s is the latency or the startup time for the data transfer and t_w is the per-word transfer time.

Answer:

Hypercube algorithm for computation of prefix sums carries 2 marks.

Exact expression for the total time taken by the algorithm carries 3 marks.