Sardar Patel Institute of Technology

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

(Autonomous College Affiliated to University of Mumbai)

End Semester Examination - Synoptic

2017-18

Max. Marks: 100

Class: M.Tech. (1^{st} Year)

Course Code: CE922

Name of the Course: High Performance Computing

Duration: 180 Min

Semester: II

Branch: Computer

Instruction:

(1) All questions are compulsory

(2) Draw neat diagrams

(3) Assume suitable data if necessary

Q No.	Question	Max. Marks	CO
Q.1 (a)	State Bernsteins's three conditions with example. **Answer:** Each Bernsteins's condition carries 1 Mark (1*3=3 Marks). An example showing Bernsteins's three condition carries 2 Marks.	05	CO1
Q.1 (b)	State Amdahl's Law and Gustafson-Barsis's Law. **Answer:** Amdahl's Law carries 2.5 Mark. Gustafson-Barsis's Law carries 2.5 Marks.	05	CO1
Q.1 (c)	List any five static network topologies. **Answer:** Each static network topology carries 1 Mark. Five static network topologies carry 5 Marks.	05	CO3
Q.1 (d)	List any five performance metrics for Parallel Systems. **Answer:** Each performance metric carries 1 Mark. Five performance metrics carry 5 Marks.	05	CO1
Q.2 (a)	Compare Kernel-Level and User-Level Lightweight Communication Systems. **Answer:** Each comparative discussion between Kernel-Level and User-Level Lightweight Communication Systems carries 2 Mark. Five comparative discussions carry 10 Marks.	10	CO3
Q.2 (b)	Exemplify *Recursive Decomposition* technique. **Answer:** Discussion on an example of *Recursive Decomposition* technique carries 8 Marks. Neat labeled diagram of the example carries 2 Marks.	10	CO1

Q.3 (a)	Discuss Agglomeration and Mapping in the design of Floyd's All-Pair Shortest-Paths Parallel Algorithm. **Answer:** Discussion on Agglomeration in the design of Floyd's All-Pair Shortest-Paths Parallel Algorithm carries 5 Marks. Discussion on Mapping in the design of Floyd's All-Pair Shortest-Paths Parallel Algorithm carries 5 Marks.	10	CO4
Q.3 (b)	Discuss Data Decomposition options in the design of Sieve of Eratosthenes Parallel Algorithm. **Answer:** Each Decomposition option in the design of Sieve of Eratosthenes Parallel Algorithm carries 5 Marks. Two Decomposition options carry 10 Marks.	10	CO3
Q.4 (a)	Describe a typical zero-copy protocol of transferring a large message using Active Messages. **Answer:** A detailed explanation of zero-copy protocol to transfer large message using Active Messages carries 8 Marks. Neat labeled diagram of the protocol carries 2 Marks.	10	CO2
	OR		
	Derive the equations for Speedup and Isoefficiency in Parallel Systems. **Answer:** Derivation of Speedup equation in Parallel Systems carries 5 Marks. Derivation of Isoefficiency equation in Parallel Systems carries 5 Marks.	10	CO2
Q.4 (b)	Discuss the impact of location of Network Interface on the performance and usability inside the System. **Answer:** Discussion of three locations of Network Interface on the performance and usability inside the System carry 9 Marks. Neat labeled diagram of three location of Network Interface carries 1 Mark.	10	CO3
	OR		
	Discuss the various fields in ServerNet address space. **Answer:** Discussion of the various fields in ServerNet address space carry 9 Marks. Neat labeled diagram of ServerNet address space carries 1 Mark.	10	CO3
Q.5 (a)	Discuss any five MPI functions with arguments. **Answer:** Each MPI function with arguments carries 2 Marks. Five MPI functions carry 10 Marks.	10	CO3
	OR		

	Differentiate Rowwise and Columnwise Block-Striped design of parallel Matrix-Vector Multiplication. **Answer:** Each comparative discussion on Rowwise and Columnwise Block-Striped design of parallel Matrix-Vector Multiplication carries 2 Marks. Five comparative discussions carry 10 Marks.	10	CO3
Q.5 (b)	Suppose we have chosen a block agglomeration of n elements (labeled $0, 1, \ldots, n-1$) to p processes (labeled $0, 1, \ldots, p-1$) in which process i is responsible for elements $\lfloor in/p \rfloor$ through $\lfloor (i+1)n/p \rfloor - 1$. Prove that the last process is responsible for $\lceil n/p \rceil$ elements. **Answer:** The valid step-by-step proof of the last process being responsible for $\lceil n/p \rceil$ elements carries 10 Marks.	10	CO1
	OR		
	Prove that there exists a p_0 such that $p > p_0$ implies $\Psi(n,p) < \Psi(n,p_0)$ using the definition of speedup $\Psi(n,p) \leq \frac{\sigma(n)+\varphi(n)}{\sigma(n)+\varphi(n)/p+\kappa(n,p)}$. Assume $\kappa(n,p) = C \; log \; p$ **Answer:** The valid step-by-step proof of existence of p_0 such that $p > p_0$ implies $\Psi(n,p) < \Psi(n,p_0)$ carries 10 Marks.	10	CO1