Parallel Computing

SOURCE: 01	**Parallel and Distributed Computing**
01	Introduction to Parallel and Distributed Systems and Why We Use It
02	Why Not to Use Parallel and Distributed Computing
03	Speed Up Scalability and Amdhal's Law Part-1
04	Hardware Architecture
05	Networks of Workstations (NOW) and Distributed Memory
06	Computer Clusters
07	Software Architecture and Threads
08	Processes and Message Passing Programming Paradigm
09	Distributed Shared Memory (DSM)
10	Research and Project Topics – Parallel and Distributed Computing
11	Parallel Algorithms
12	Concurrency and Synchronization in Parallel Computing
13	Data and Work Partitioning
14	Parallelization Strategies and Granularity Part-1
15	Parallelization Strategies and Granularity Part-2
16	Load Balancing | Characteristics of Tasks | Inter-Task Interaction
17	Load Balancing | Static and Dynamic Load Balancing
18	Shared Memory Programming
19	Distributed Memory Programming | MPI and PVM
20	Aurora Scoped Behavior and Abstract Data Type | Aurora Supercomputer
SOURCE: 02	**Parallel and Distributed Computing**
01	Parallel and Distributed Computing – Introduction
02	Horizontal Vertical Scalability
03	Flynn's Taxonomy (SISD, SIMD, MISD, MIMD)
04	Multithreading, Super-Scalar Processors, Intel HT
05	Shared Memory Architecture
06	CPU to RAM Connection Strategies
07	Distributed Memory Architecture
08	Routing, Routing Table, Routing Mechanism
09	Threads and Thread Models
SOURCE: 03	**Parallel Computing and Distributed System**
01	Parallel Computing and Types of Architecture
02	Flynn's Classification or Taxonomy in Parallel Computing
03	Pipelining Concept
04	Synchronization in Process Distribution System Explained | Distributed System and Computing
05	Lamport's Logical Clock Algorithm Explained | Distributed System and Computing
06	Bully and Ring Election Algorithm Explained | Distributed System and Computing
07	Remote Procedure Call Explained | Distributed System and Computing
08	Transparency in Distributed System | Distributed System and Computing
09	Load Balancing Algorithm and Design | Distributed System and Computing
SOURCE: 04	**Parallel Processing and Computing – Advanced Computer Architecture**
01	Parallel Processing and Computing | Introduction Part-1
02	Parallel Processing and Computing | Introduction Part-2 | VonNeumann Architecture
03	Parallel Processing in Uniprocessor System | Parallel Processing Mechanism
04	Flynn's Classification | SISD, SIMD, MISD, MIMD

05	Feng’s Classification and Hardler’s Classification
06	Amdahl’s Law in Parallel Processing | Speed Up Performance Law
07	Principles of Scalable Performance | Performance Metrics
08	Parallel Processing in Memory | Shared Memory | Distributed Memory
09	Moore’s Law
10	Parallel Algorithms | Parallel Algorithm Complexity
11	System Attributes to Performance | CPU Performance Evaluation
12	Numerical on System Attribute to Performance | Find CPI-MIPS-Execution Time
13	Parallel Programming Models
14	Cache Coherence | Cache Coherence Protocols
15	Cache Coherence Protocols | Snoopy Bus Protocol
16	Directory Based Protocol | Cache Coherence Protocols
17	Conditions of Parallelism | Data, Control and Resource Dependence
18	Numerical on Data Dependency and Resource Dependency Part-1
19	Numerical on Data Dependency and Resource Dependency Part-2
20	Bernstein’s Conditions of Parallelism | Conditions of Parallelism Part-2
21	Numerical on Detection of Parallelism Using Bernstein’s Condition
22	Program Flow Mechanisms | Control Flow, Data Flow, Demand Driver
23	Pipelining Concept | Example | Space Time Diagram
24	Linear Pipeline Processor | Asynchronous and Synchronous | Pipeline vs Non-Pipeline
25	Numerical on Pipelining and Performance Part-1
26	Numerical on Linear Pipelining Part-2
27	Numerical on Linear Pipelining Part-3
28	Non-Linear Pipeline Processor | Linear vs Non-Linear Pipeline
29	Classification of Pipeline Processors
30	General Pipeline and Reservation Table | Latency Analysis and Conflict-Free Schedule
31	Numerical 1 on Reservation Table | Find Forbidden Latency, Collision Vector, Greedy Cycle, MAL
32	Numerical 2 on Reservation Table | Find Forbidden Latency, Collision Vector, Greedy Cycle, MAL
33	Numerical 3 on Reservation Table | Find Forbidden Latency, Collision Vector, Greedy Cycle, MAL
34	Numerical 4 on Reservation Table | Find Forbidden Latency, Collision Vector, Greedy Cycle, MAL
35	Numerical 5 on Reservation Table | Find Forbidden Latency, Collision Vector, Greedy Cycle, MAL
36	RISC and CISC in Computer Architecture | COA | CSA
37	Control Unit in Computer Architecture | Control Unit Block Diagram and Types
38	Hardwired Control Unit in Computer Architecture | Block Diagram | Working | COA | CSA

Parallel Programming

SOURCE: 01	Parallel Programming in OpenMP
01	Introduction to Parallel Programming
02	Parallel Architectures and Programming Models
03	Pipelining
04	Super pipelining and VLIW
05	Memory Latency
06	Cache and Temporal Locality
07	Cache, Memory Bandwidth and Spatial Locality
08	Intuition for Shared and Distributed Memory Architectures
09	Shared and Distributed Memory Architectures
10	Interconnection Networks in Distributed Memory Architectures
11	OpenMP: A Parallel Hello World Program
12	Program with Single Thread
13	Program Memory with Multiple Threads and Multi-Tasking
14	Context Switching
15	OpenMP: Basic Thread Functions
16	OpenMP: About OpenMP
17	Shared Memory Consistency Models and The Sequential Consistency Model
18	Race Conditions
19	OpenMP: Scoping Variables and Some Race Conditions
20	OpenMP: Thread Private Variables and More Constructs
21	Computing Sum: First Attempt at Parallelization
22	Manual Distribution of Work and Critical Sections
23	Distributing for Loops and Reduction
24	Vector-Vector Operations (Dot Product)
25	Matrix-Vector Operations (Matrix-Vector Multiply)
26	Matrix-Matrix Operations (Matrix-Matrix Multiply)
27	Introduction to Tasks
28	Task Queues and Task Execution
29	Accessing Variables in Tasks
30	Completion of Tasks and Scoping Variables in Tasks
31	Recursive Task Spawning and Pitfalls
32	Understanding LU Factorization
33	Parallel LU Factorization
34	Locks
35	Advanced Task Handling
36	Matrix Multiplication Using Tasks
37	The OpenMP Shared Memory Consistency Model
38	Introduction to Parallel Programming
39	OpenMP and MPI Course Intro
40	Parallel Architectures and Programming Models
41	Application Distributed Histogram Updation
42	Application Deep Learning
43	Applications Finite Element Method
44	Discussion on PMI Collectives Design
45	Introduction to MPI and Basic Calls

46	MPI Calls for Broadcasting Data
47	MPI Call Send and Receive Data
48	MIP Collective and MPI Broadcast
49	MPI Gathering and Scattering Collectives
50	MPI Non-Blocking Calls
51	MPI Reduction and Alltoall Collectives
52	Alltoal on the Hypercube
53	An Improved Algorithm for Altoall on The Hypercube Using E Cube Routing
54	Broadcast and Reduce with Recursive Doubling
55	Characterization of Interconnects
56	D Dimensional Torus
57	Discussion of Message Sizes in Analysis
58	Hockeney Model
59	Hypercube
60	Linear Arrays 2D Mesh and Torus
61	Lower Bounds
62	Pipeline Based Algorithm for Allreduce
63	Pipeline Based Algorithm for Broadcast
64	Reduce Scatter and All Gather with Recursive Doubling
65	Reduce Scatter and All reduce on The Hypercube
66	Revisiting Reduce Scatter on 2D Mesh
67	Scatter and Gather with Recursive Doubling
68	Trees and Cliques
69	Introduction to Parallel Graph Algorithms
70	Prims Algorithm
71	Performance Considerations
72	OpenMP Based Shared Memory Parallelization for MST
73	MPI Based Distributed Memory Parallelization for MST
74	Distributed Memory Settings and Data Distribution
75	Distributed BFS Algorithm
76	Breadth First Search BFS Using Matrix Algebra
77	BFS Shared Memory Parallelization Using OpenMP
78	Sequential Algorithm Adaption from Prims
79	Parallelization Strategy for Prims Algorithm
80	Dry Run with The Parallel Strategy
81	Johnsons Algorithm with 1D Data Distribution
82	Speedup Analysis on A Grid Graph
83	Floyds Algorithm for All Pair Shortest Paths
84	Floyds Algorithm with 2D Data Distribution
85	Adaptation to Transitive Closures
86	Parallelization Strategy for Connected Components
87	Analysis for Parallel Connected Components