

## University of Mumbai

Program: **BE Information Technology SEM VII**

Curriculum Scheme: Rev2016

Examination: SE/TE/BE Semester VII

Course Code: ITDLO7033 and Course Name: High Performance Computing

Time: 2 hour 30 minutes

Max. Marks: 80

<b>Q1.</b>	<b>Choose the correct option for following questions. All the Questions are compulsory and carry equal marks</b>
1.	----- is the simultaneous use of multiple compute resources to solve a computational problem
Option A:	parallel computing
Option B:	Serial Computing
Option C:	Parallel Computers
Option D:	Parallel programming
2.	Flynn's taxonomy distinguishes multi-processor computer architectures according to how they can be classified along the two independent dimensions of ----- and -----
Option A:	Single, Multiple
Option B:	Instruction Stream, Data Stream
Option C:	Data model, network model
Option D:	Single Instruction, Multiple Data
3.	Which of the following are not characteristics of Message Passing Model / Distributed Memory?
Option A:	Data transfer usually requires cooperative operations to be performed by each process. For example, a send operation must have a matching receive operation
Option B:	The shared memory component can be a shared memory machine and/or graphics processing units (GPU).
Option C:	Tasks exchange data through communications by sending and receiving messages
Option D:	A set of tasks that use their own local memory during computation. Multiple tasks can reside on the same physical machine and/or across an arbitrary number of machines.
4.	----- refers to the practice of distributing approximately equal amounts of work among tasks so that all tasks are kept busy all of the time.
Option A:	Load balancing
Option B:	Data Dependencies
Option C:	Granularity
Option D:	Synchronization
5.	send(void *sendbuf, int nelems, int dest) receive(void *recvbuf, int nelems, int source)  Find out the <b>Incorrect statement</b> from the given option.
Option A:	<i>sendbuf</i> points to a buffer that stores the data to be sent

Option B:	<i>nelems</i> is the number of data units to be sent and received
Option C:	<i>recvbuf</i> points to a buffer that stores the data to be received
Option D:	<i>source</i> is the identifier of the process that receives the data
6.	To find out efficiency of a parallel program which formula we can use?
Option A:	$T_o = pT_p - T_s$ .
Option B:	$S = \Theta\left(\frac{n}{\log n}\right)$ .
Option C:	$E = \frac{1}{1 + \frac{2p(t_s + t_p n)}{9t_c n^2}}$ .
Option D:	$\bar{E} = \frac{S}{p} = \frac{T_s}{pT_p}$
7.	MPI provides the ----- that allows us to partition a Cartesian topology into sub-topologies that form lower-dimensional grids.
Option A:	<code>keep_dims</code>
Option B:	<code>MPI_Comm_split</code>
Option C:	<code>MPI_Cart_sub</code> function
Option D:	<code>comm_cart</code>
8.	<p>The above diagram represents an example of which generalization?</p>
Option A:	All-to-all broadcast
Option B:	All-to-all personalized communication
Option C:	all-to-all reduction
Option D:	Scatter and gather operations
9.	In some interactions, the data or work needed by a task or a subset of tasks is explicitly supplied by another task or subset of tasks. Such interactions are called ----- interactions
Option A:	regular
Option B:	read-write
Option C:	one-way
Option D:	two-way
10.	Which of the following is not a part of Performance Metrics?
Option A:	Execution Time

Option B:	overhead function
Option C:	Idling
Option D:	Speedup

<b>Q2.</b> <b>(20 Marks)</b>	<b>Solve any Four out of Six</b>	<b>5 marks each</b>
A	Explain the Pros and Cons of Open MP.	
B	Explain all-to-all broadcast on hycube topologies.	
C	Explain granularity of a parallel system?	
D	Write a Short note on SIMD matrix multiplication.	
E	What is meant by grain packing and scheduling in parallel Processing.	
F	Explain Image dithering example in Inter-Task Interactions.	

<b>Q3</b> <b>(20 Marks)</b>	<b>Solve any Two Questions out of Three</b>	<b>10 marks each</b>
A	Explain decomposition techniques with the help of suitable example.	
B	What are the Limitations of Memory System Performance?	
C	Write a MPI program that will sort a list of numbers using the odd-even sorting algorithm.	

<b>Q4.</b> <b>(20 Marks)</b>		
A	<b>Solve any Two</b>	<b>5 marks each</b>
i.	Explain Communication Model of Parallel Platforms.	
ii.	Give the advantages in using non- uniform memory access model.	
iii.	Explain Non-Blocking Message Passing Operations	
B	<b>Solve any One</b>	<b>10 marks each</b>
i.	<p style="text-align: center;"><b>Task-dependency graphs</b></p>	

	<p>For the task graphs given in above figure determine the following:</p> <ol style="list-style-type: none"><li>1. Maximum degree of concurrency.</li><li>2. Critical path length.</li><li>3 Maximum achievable speedup over one process assuming that an arbitrarily large number of processes is available.</li><li>4. The minimum number of processes needed to obtain the maximum possible speedup.</li></ol>
ii.	Write a short note on Topologies and Embedding