Name: **Enrolment No:**	UPES

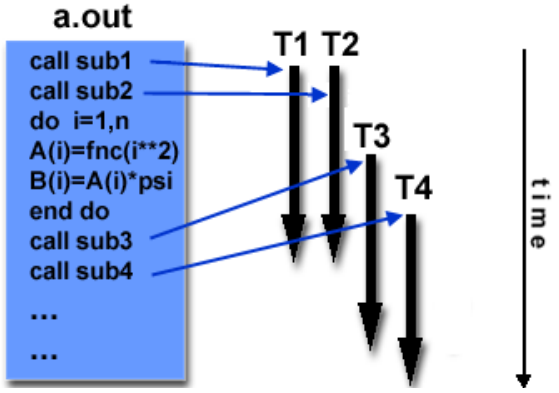
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2018

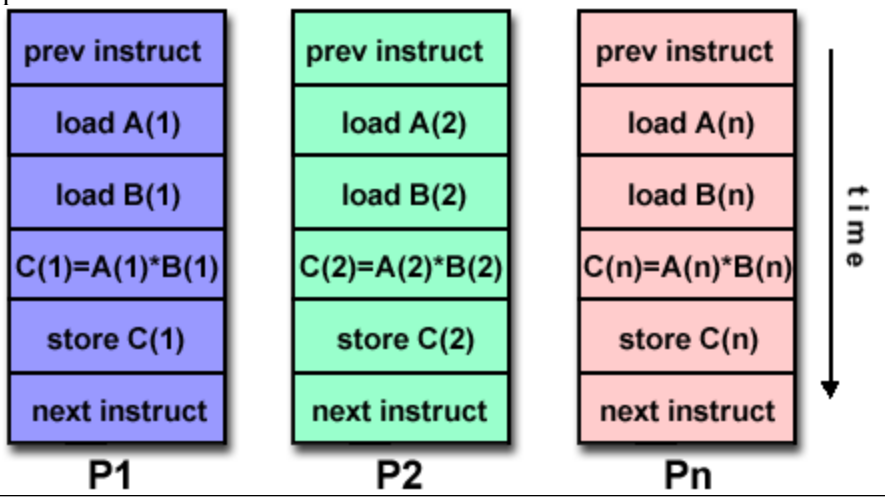
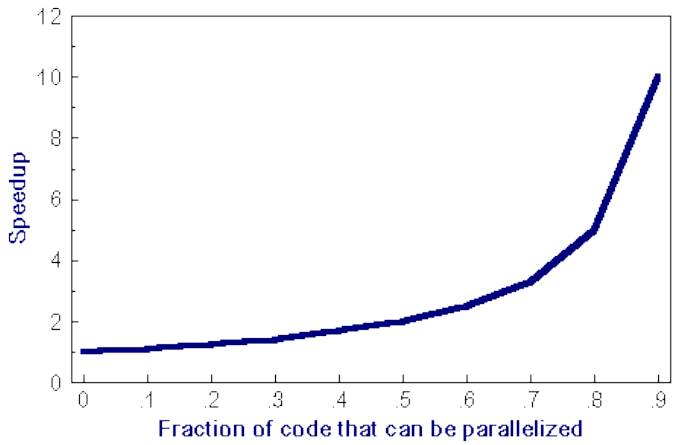
Course: High Performance and Parallel Computing Applications for CFD **Semester: III**
Programme: M.Tech CFD
Time: 03 hrs. **Max. Marks: 100**
Instructions: Q8 is having internal choice

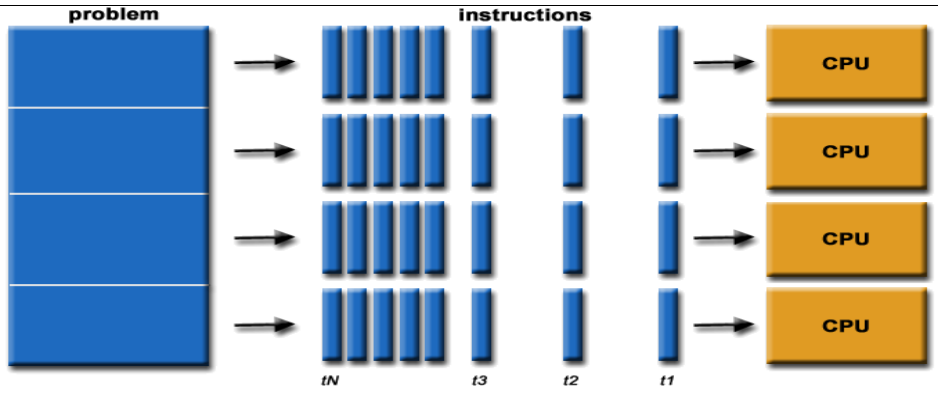
SECTION A

S. No.		Marks	CO
Q 1	**Define the following terms** 1. Task: 2. MISD: 3. FPGA: 4. Parallel Execution: 5. Granularity:	**5**	**CO1**
Q 2	**Explain the following terms to designing a parallel program** 1. Bottlenecks 2. Coarse Grain Parallelism 3. Types of synchronization 4. Scalability 5. Uniform Memory Access	**10**	**CO1**
Q 3	Explain about the Open MP? How it used and what are the platforms that it is applicable for Parallel Coding? What are its advantages and disadvantages?	**5**	**CO4**

SECTION B

Q 4	Which type of the parallel programming model is described in the given figure, explain the implementation of the parallel programming model. Give a specific example where we can use this parallel programming model in CFD. 	**10**	**CO2**

Q 5	Explain the parallel processing concept below in relation to a CFD problem. Give a specific example of a CFD Numerical Method or a solution algorithm where this particular concept can be applied.  	**10**	**CO2 & CO3**
Q 6	Classify each of the sorting methods in FORTRAN in view of Parallel Coding Algorithms and explain which methods are more suitable for Parallel Applications?	**10**	**CO3**
Q 7	Write the algorithm and flowchart for each sorting methods and compare the methods with each other.	**10**	**CO3**
	SECTION-C		
Q 8	(a)Explain the Amdahl's law with the help of following diagram. **(5 Marks)**  (b)Use the diagram below to explain how it can be useful in solving a CFD related problem. Take the McCormack Technique in CFD for the solution of 2D Inviscid, Incompressible Flow problem as based upon time step. If you wanted to solve for velocity (u,v), how would you create the algorithm for the solution using the diagram below. Please explain and apply to the problem by using Parallel Computational Principles. (15 Marks)	**20**	**CO4**

	 **(Or)** To design a parallel programming what are the parameters we have to consider, list all of them. Take the McCormack Technique in CFD for the solution of 2D Inviscid, Incompressible Flow problem as based upon time step as an example, explain in detail about all the parameters to design a parallel program. (20 Marks)		
Q9	(a) Explain Shell Sort with an example of an array with 12 elements and show how the sort works by showing the breakdown of the array in each step. **(10 Marks)** (b) Develop a FORTRAN code for sorting an array of 12 elements by using Circle Sort Method. **(10 Marks)**	**20**	**CO3**