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

2018-19

Max. Marks: 60 | Duration: 180 Min

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

Course Code: CE922 | Branch: Computer Engineering

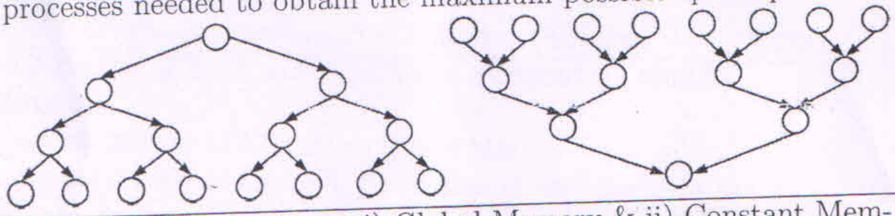
Name of the Course: High Performance Computing

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)	Define the following terms : i) ServerNet address space and ii) ATM Adaption Layer.	04	CO2
Q.1 (b)	Exemplify the matrix-vector multiplication using MPI.	08	CO3
Q.2 (a)	Differentiate between User-Level and Kernel-Level Lightweight Communications Systems.	04	CO2
Q.2 (b)	Summarize Kernels and the OpenCL Execution Model.	08	CO4
Q.3 (a)	Elaborate Translation Table and Handler Table of Endpoint in the context of Active Messages.	04	CO2
Q.3 (b)	Consider the following two task graphs, Determine : i) Maximum degree of concurrency, ii) Critical path length, iii) Maximum achievable speedup over one process assuming that an arbitrarily large number of processes is available, and iv) The minimum number of processes needed to obtain the maximum possible speedup. 	08	CO1
Q.4 (a)	Recall the following terms i) Global Memory & ii) Constant Memory in the context of OpenCL Memory Model.	04	CO3
Q.4 (b)	Apply LU factorization algorithm to factor the following non-singular matrix A into the product of a lower triangular matrix L with a unit diagonal and an upper triangular matrix U. Also show decomposition of A matrix in multiple tasks. $$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$ **OR**	08	CO1

	Exemplify LU factorization algorithm to factor a non-singular square matrix.	08	CO1
Q.5 (a)	Define the following terms related to parallelism, dependence relations and various system interconnect architectures: i) Degree of parallelism, ii) Control Dependence, iii) Bernstein conditions, iv) I/O Dependence, v) Node Degree, vi) Network Diameter, vii) Bisection Bandwidth & viii) Multistage networks.	04	CO2
Q.5 (b)	Draw *fine-grain* and *coarse-grain program graphs* for the following program. **Var** $a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r$ **Begin** 1. $a := 1$ 2. $b := 2$ 3. $c := 3$ 4. $d := 4$ 5. $e := 5$ 6. $f := 6$ 7. $g := a \times b$ 8. $h := c \times d$ 9. $i := d \times e$ 10. $j := e \times f$ 11. $k := d \times f$ 12. $l := j \times k$ 13. $m := 4 \times l$ 14. $n := 3 \times m$ 15. $o := n \times i$ 16. $p := o \times h$ 17. $q := p \times q$ 18. $r := 5 \times q$ **End**	08	CO1
	OR		
	Perform a data dependence analysis on each statements (S1–S5) of the following program fragments. Show the dependence graph among the statements with justification. S1 $a = b$ S2 $b = c + d$ S3 $e = a + d$ S4 $b = 3$ S5 $f = b * 2$	08	CO1