M.E. First Semester (Computer Sci. & Engg.) (P.T.) (CBS)

13161 : Algorithmics

1 RME 2 / 1 KMEF 2 / 1 RMEF 2

P. Pages : 3 **AW - 3684**

Time : Three Hours Max. Marks : 80

Notes :
1. Due credit will be given to neatness and adequate dimensions.
2. Assume suitable data wherever necessary.
3. Illustrate your answer necessary with the help of neat sketches.
4. Use of pen Blue/Black ink/refill only for writing the answer book.

1. a) Explain average and workcase analysis using two sorting algorithms. **7**

i) Insertion Sort ii) Selection Sort

b) What is an elementary operation explain with suitable example. **6**

OR

2. a) Show that Pigeon-hole sorting takes a time in the order of n to sort n elements that are within bounds. Sketch the appropriate algorithm. **7**

b) What do you mean by conditional asymptotic notation ? Explain with example. **6**

3. a) Solve the following recurrence by change of variable method. **7**

$$T(n)=\begin{cases} 1 & \text{if } n=1 \\ 3T(n/2)+n & \text{if } n \text{ is a power of } 2\ n>1 \end{cases}$$

b) Explain sequencing rule. **6**

OR

4. a) Solve the following recurrence by Range transformation method. **7**

$$T(n)=\begin{cases} 1/3 & \text{if } n=1 \\ n\,T^2(n/2) & \text{otherwise} \end{cases}$$

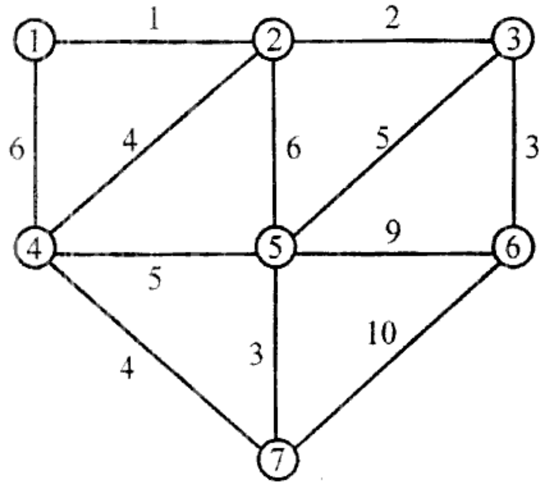
b) Explain amortised analysis. **6**

5. a) Explain Knapsack algorithm to find an optimal solution to the following instance of Knapsack problem $n=3$ $M=20$ $(p_1, p_2, p_3)=(25, 24, 15)$ and $(w_1, w_2, w_3)=(18, 15, 10)$ **7**

b) Explain the method suggested by Volker Strassen for matrix multiplication what is its time complexity ? What is the time complexity of the method suggested by Victor Pan. **7**

OR

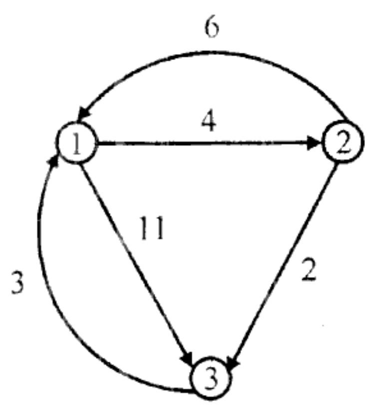
6. a) Simulate the Kruskals and Prim's algorithm to generate a minimum spanning tree for foll. graph. **7**



b) Explain Scheduling with deadlines and solve following example where n = 4 jobs to execute. **7**

i	1	2	3	4
g_i	50	10	15	30
d_i	2	1	2	1

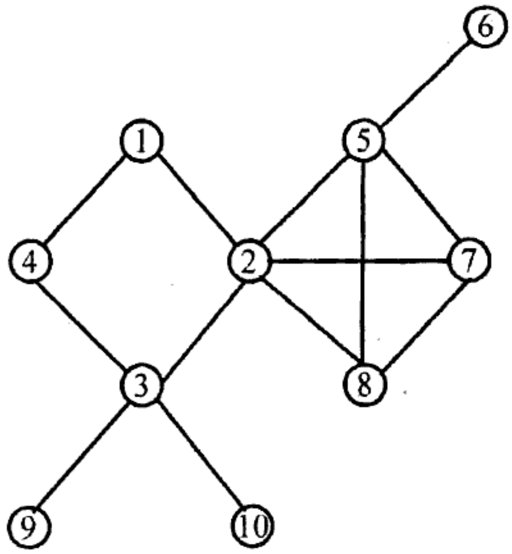
7. a) Explain the Floyd's algorithm for computing all pairs shortest path. Also find the matrix D that gives the length of shortest path between pair of nodes for the following directed graph. **8**



b) Explain Breadth first search algorithm using suitable example. **(**

OR

8. a) Illustrate how the algorithm for finding the articulation points of an undirected graph works on following graph starting at node 1. **8**



b) Explain the minimax principle. **6**

9. a) Show that the algorithm parpaths can be executed using $\theta(n^3 \log n)$ processors taking a time in $\theta(\log^2 n)$. **7**

b) Explain parallel sorting algorithm in detail. **6**

OR

10. a) Explain the Buffon's needle theorem in detail. **7**

b) What is a probabilistic algorithm ? How is it different from deterministic algorithm ? Explain with an example. **6**

11. a) Prove that $MQ \leq^{\ell} MT$ assuming MT is smooth. **7**

b) Prove the following theorem $P \subseteq NP$. **6**

OR

12. a) Prove that if X and Y are two decision problems such that $X \leq_M^P Y$ then $X \leq_T^P Y$ **7**

b) Explain in brief the NP - hard problems. **6**

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