## T.E/Insem/APR - 44
## T.E. (Information Technology)
## DESIGN AND ANALYSIS OF ALGORITHMS
## (2012 Pattern) (Semester - II)

*Time : 1 Hour]*

*[Max. Marks : 30*

*Instructions to the candidates :*

1) *Answer Q.1 or Q.2 , Q.3 or Q.4 ,Q.5 or Q.6.*

2) *Neat diagrams must be drawn wherever necessary.*

3) *Figures to the right side indicate full marks.*

4) *Assume Suitable data if necessary*

*Q1)* What is the purpose of proof techniques to apply on algorithms? Explain the method of proof by mathematical induction in detail and how do we apply the proof by mathematical induction to prove that "sum of the cubes of first n positive integers is equal to the square of sum of these integers". **[10]**

OR

*Q2)* a) Solve the following recurrence relation using substitution method. **[5]**

$T(n) = 4T(n/3) + n^2$.... if $n \geq 2$

$T(1) = 1$ ...... if $n = 1$

b) Explain the potential method used in Amortized analysis with an example. **[5]**

*Q3)* Write an algorithm for sorting n numbers using merge sort. Determine its time complexity using correct recurrence relation. **[10]**

OR

*P.T.O.*

*Q4)* a) Apply Dijkstra's algorithm for finding all shortest paths from a single source '1' in a given graph. Also analyze the Dijkstra's algorithm using Minheap/priority queue. **[6]**
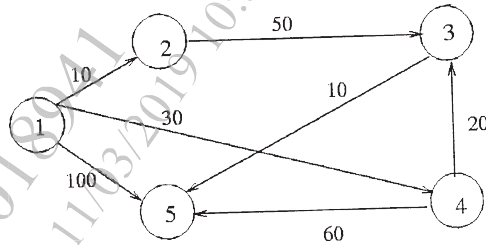


b) Analyze the time complexity of larger integer multiplication by divide and conquer strategy. **[4]**

*Q5)* Solve the following instance of OBST by giving the recurrence relation for solving it. Draw the final OBST and give the optimal cost. Given: n = 4, a(1 :4)={Bihar, Gujarat, Mizoram, Tripura}, p(1 :4) ={ 1/20,1/5,1/10,1/20} and q(0:4)={1/5,1/10, 1/5, 1/20, 1/20}. **[10]**

OR

*Q6)* a) State the principle of optimality. What is the significance of principle of optimality in dynamic programming? Explain it with an example. **[6]**

b) Compare dynamic programming with divide and conquer approach. **[4]**

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