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RAMAIAH
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NAAC with 'A' Grade

EXAMINATIONS SEPTEMBER /OCTOBER 2020
SUPPLEMENTARY SEMESTER / GRADE IMPROVEMENT/ RE –REGISTERED CANDIDATES

Program	:	**B.E. : Computer Science Engineering**	**Semester**	:	**IV**
Course Name	:	**Design and Analysis of Algorithm**	**Max. Marks**	:	**100**
Course Code	:	**CS42**	**Duration**	:	**3 Hrs**

Instructions to the Candidates:

- Answer any one full question from each unit.

UNIT – I

1. a) Check if the following equalities are correct or not. If not correct, then write the proper justification for the same. CO1 (06)
   i. $5n^2 - 6n = \theta(n^2)$
   ii. $n! = O(n^n)$
   iii. $2n^2 2^n + n \log n = \theta(n^2 2^n)$

   b) Determine the stable matching set S for the following set of men and women using Gale-Shapley algorithm. CO1 (06)

Men's Preference List				
A	R	Q	S	P
B	Q	P	R	S
C	Q	S	P	R
D	R	P	S	Q

Women's Preference List				
P	A	B	D	C
Q	C	A	D	B
R	C	B	D	A
S	B	A	C	D

   c) What is meant by "Best Valid Partner" with respect to Gale-Shapley algorithm? Prove that "Every execution of the G-S algorithm results in the set S*". CO1 (08)

2. a) Write an algorithm to find out the maximum distance between a pair of points in a given plane with n points. CO1 (05)
   b) Prove that "For every b>1 and every x>0, we have $\log_b n = O(n^x)$". CO1 (05)
   c) Describe the five representative problems with examples to each. CO1 (10)

UNIT – II

3. a) List the different applications of BFS and DFS algorithms. CO2 (04)
   b) Analyze the running time of Merge-Sort using the following methods: CO2 (06)
   i. Unrolling method ii. Substituting a solution.
   c) Write the Counting Inversion algorithm. Find out the number of inversions for the following set of number. CO2 (10)
   (25, 14, 19, 22, 15, 16, 20, 10, 17)

4. a) Find the Topological ordering for the following given graph using Source Removal method and DFS method. CO2 (06)

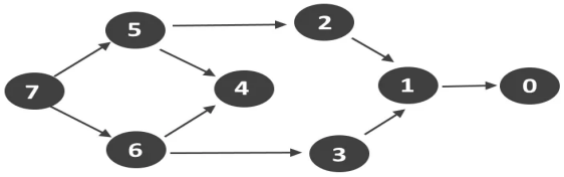

Fig.4(a)

b) Write an algorithm to sort the given numbers using divide and conquer method. CO2 (06)

c) Design an algorithm to determine whether a given graph is bipartite or not. CO2 (08)

UNIT – III

5. a) Prove that "Greedy algorithm for interval scheduling returns an optimal set A". CO3 (05)

b) Construct the optimal prefix code for S={a,b,c,d,e,f} and frequencies f_a=0.25, f_b=0.30, f_c=0.15, f_d=0.15, f_e=0.08, f_f=0.07. Find the average code word length. CO3 (07)

c) Discuss Kruskal's algorithm to find the minimum spanning tree. Apply the same for the following graph. CO3 (08)

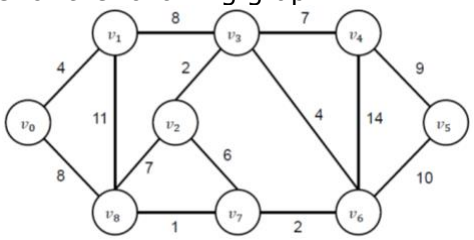

Fig.5(c)

6. a) Write the greedy algorithm for Interval Scheduling for minimizing the maximum lateness. Explain the running time of the algorithm. CO3 (06)

b) Prove that the"Prim's Algorithm produces a minimum spanning tree for the given graph G". CO3 (06)

c) Construct single source shortest path for the following graph with "A" as the source vertex. Using Dijkstra's algorithm. CO3 (08)

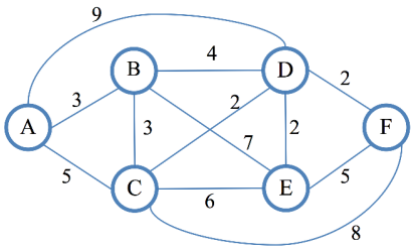

Fig.6(c)

UNIT – IV

7. a) Design a memoization procedure to determine the maximum weight for a given set of n intervals, and each interval having a weight w. CO4 (05)

b) Discuss an algorithm to find the shortest path for a given graph G using Bellman Ford algorithm. Explain how it is different from Dijkstra's algorithm. CO4 (06)

c) Apply the Ford Fulkerson algorithm to find the maximum flow path from **S** to **T** in the given flow network. CO4 (09)

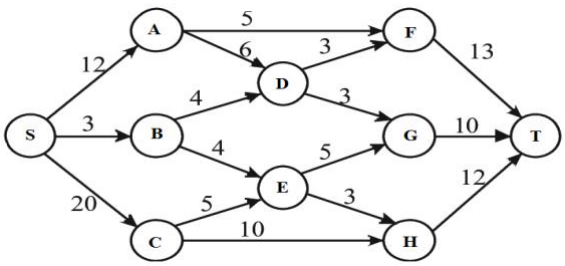

Fig.7(c)

8. a) Write the algorithm for Subset Sum problem. Discuss the recurrence relation used in the algorithm. CO4 (06)
   b) Explain the airline scheduling algorithm. CO4 (06)
   c) Calculate the maximum value for the following problem by using knapsack algorithm with capacity W=10. CO4 (08)

Item	Weight	Value
1	3	100
2	2	20
3	4	60
4	1	40

UNIT – V

9. a) Find all the Hamiltonian Paths in the given graph. CO5 (05)

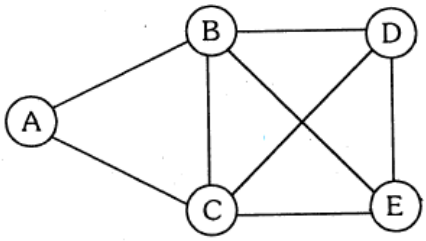

Fig.9(a)

   b) Explain the general strategy to prove the given problems as NP-Complete problems. CO5 (05)
   c) Explain Vertex cover and Independent set problem with an example. Construct a proof to determine that both of the problems are NP-Complete. CO5 (10)

10. a) Prove that Hamiltonian Path is NP-Complete. CO5 (05)
    b) Define P, NP, NP-Complete & NP-Hard problems. Give examples. CO5 (05)
    c) Explain how the Circuit Satisfiability is a NP-Complete problem. CO5 (10)

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