wednesday DAA Assignment-2 N.V.S.K.kalyani
27-5-2020 17UN1A0584
UNIT-2 3rd B.tech CSE-C

2 marks

1. write the appropriate conditions for solving knapsack problem using greedy method.

Ans To solve this knapsack problem using greedy method our goal is

1. choose only those objects that gives max profit.
2. The total weight of selected objects should $\leq m$.

The total problem can be stated as,

$$\text{maximize} \sum_{1 \leq i \leq n} Ax_i \rightarrow (1)$$

$$\text{subject to} \sum_{1 \leq i \leq n} w_i x_i \leq m \rightarrow (2) \text{ and}$$

$$0 \leq x_i \leq 1, \quad 1 \leq i \leq n \rightarrow (3)$$

→ A feasible solution for this problem is any set $(x_1, x_2, \dots x_n)$ satisfying equation 2 & 3

→ An optimal solution is a feasible solution for which equation (1) is maximized.

2. Define feasible solution and optimal solution?

Ans Feasible solution :- Any subset that satisfies the given constraints of the problem is known as feasible solution.

optimal solution :- A feasibe solution that either maximizes or minimizes the given object functi-on is called an optimal solution.

174N1A0584

3. List out the applications of Greedy method?

Ans Applications

→ knapsack problem

→ Job sequencing with Deadlines

→ minimum cost spanning tree

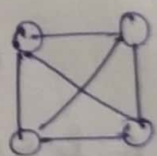
* prim's algorithm
* kruskal's algorithm

→ Single source shortest path problem.

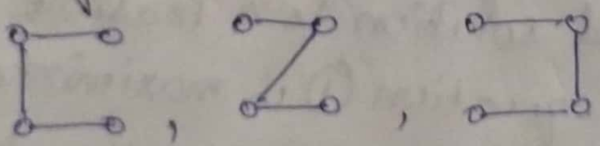
4. what is minimum cost spanning tree?

Ans Let $G = (V, E)$ be an undirected connected graph. A subgraph $T = (V, E')$ of G is a spanning tree iff T is a tree

consider the following graph



Then, some of the possible spanning trees are,



etc.,

5. Define prim's algorithm?

Ans To obtain a minimum cost spanning tree, greedy strategy devise to build the tree by considering edge by edge. The next edge is selected according to optimization criteria.

17UNIA0584

<u>Essays</u>

1 Ans) let Job must be considered as decresing order of profit

$n=7$, $(P_1, P_2, P_3, P_4, P_5, P_6, P_7) = (3, 5, 20, 18, 1, 6, 30)$

$(d_1, d_2, d_3, d_4, d_5, d_6, d_7) = (1, 3, 4, 3, 2, 1, 2)$

Job must be ascending order $= (7, 3, 4, 6, 2, 1, 5)$

J	Assigned slots	Job considered	Action	profit
ϕ	none	7	assign(1,2)	0
{7}	[1,2]	3	assign(3,4)	30
{7,3}	[3,4] [1,2]	4	assign(2,3)	50
{7,3,4}	[3,4][1,2] [2,3]	6	assign(0,1)	68
{7,3,4,6}	[0,1][3,4][1,2][2,3]	2	reject	74
{7,3,4,6}	[0,1][3,4][1,2][2,3]	1	reject	74
{7,3,4,6}	[0,1][3,4][1,2][2,3]	5	reject	74

$\therefore$ The optimal solution is

J = {3,4,6,7} with a profit value is 74

2 Ans) <u>0/1 knapsack problem</u>

consider n objects and a knapsack. Each object i has a weight w_i and the knapsack has a capacity m. If object i is placed into knapsack then a profit of $P_i x_i$. $x_i = 0$ or 1 is earned.

<u>Ex:</u>- consider the knapsack instance m=8 and n=4 let P_i and w_i are shown below.

Scanned with CamScanner

17UN1A0584

Sequence of decisions are

i	P_i	w_i
1	1	2
2	2	3
3	5	4
4	6	5

$S^0 = \{(0,0)\}$ $S_1^0 = \{(1,2)\}$

⇒ Apply merge on S^0 & S_1^0

$S^1 = \{(0,0),(1,2)\}$

⇒ Apply purging rule on S^1, we get

$S^1 = \{(0,0),(1,2)\}$ $S_1^1 = \{(2,3),(3,5)\}$

⇒ Apply merge on S^1 & S_1^1

$S^2 = \{(0,0),(1,2),(2,3),(3,5)\}$.

⇒ Applying purging rule on S^2, we get

$S^2 = \{(0,0)(1,2)(2,3)(3,5)\}$ $S_1^2 = \{(5,4)(6,6)(7,7)(8,9)\}$

⇒ Apply merge on S^2 & S_1^2 we get

$S^3 = \{(0,0)(1,2)(2,3)(3,5)(5,4)(6,6)(7,7)(8,9)\}$

⇒ Apply purging rule on S^3, we get

$S^3 = \{(0,0)(1,2),(2,3),(5,4),(6,6),(7,7),(8,9)\}$

$S_1^3 = \{(6,5),(7,7),(8,8),(11,9),(12,11),$
$(13,12),(14,14)\}$

[∵ (3,5) is discard]

⇒ Apply merge on S^3 & S_1^3 and also purging rule on S^4.

$S^4 = \{(0,0),(1,2),(2,3),(5,4),(6,6),(7,7),(8,9),(6,5)$
$(7,7),(8,8),(11,9),(12,11),(13,12),(14,14)\}$

* Now select pair (8,8) from S^4 [∵ since $w \leq m$, $8 \leq 8$]

$(8,8) \in S^{n-1}$

$(8,8) \in S^{4-1}$

$(8,8) \in S^3$, so $x_4 = 1$

174N1A0584

Now $(P_1 - P_n, w_1 - w_n) \in S^{n-1}$

$(P_1 - P_4, w_1 - w_4) \in S^{n-1}$

$(8-6, 8-5) \in S^{4-1}$

$(2,3) \in S^3$

$\therefore$ The pair $(2,3)$ is present in S^2 but also present in S^3. So, set $x_2 = 1$

$\therefore$ Finally, optimal solution is (x_1, x_2, x_3, x_4)
$= (0, 1, 0, 1)$