① Find an optimal solution to the knapsack instance

com $n=5$, $m=17$, $P_i = (20,15,10,5,1)$ & $w_i = (7,3,4,2,1)$

↳ 40.2

→ $x_i = 0$;

② for $i := 1$ to n do

for $j := 1$ to i do P_i/w_i

for $k := 1$ to j do

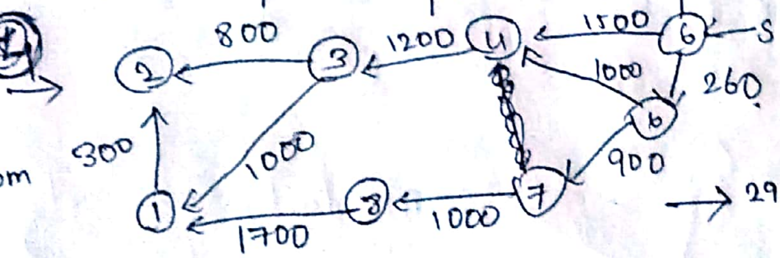
$x := x+1$;

→ determine no. of times the statement $x:=x+1$ is excuted represent in Asyomptic notation.

com

③ → Find optimal placement for 10 programs on three tapes T_0, T_1 & T_2. {20, 15, 8, 12, 6, 13, 22, 5, 9, 7}. → 51

④ → ~~Find optimal placement for 10 programs on~~ some



→ 2960, 3260, 2460, 1260, 0, 260, 1160, 1260.

→ Find single source shortest paths from node 5 to remaining nodes using Greedy approach

⑤ 5, 4, 3, 2, 5, 8, 9 Sort using Mergesort & quicksort

com

⑥ → $(P_1, P_2 \ldots P_7) = (3, 5, 20, 18, 1, 6, 30)$

$(d_1, d_2 \ldots d_7) = (1, 3, 4, 3, 2, 1, 2)$ → 74

Find optimal sequence of jobs with deadline to get Max profit.

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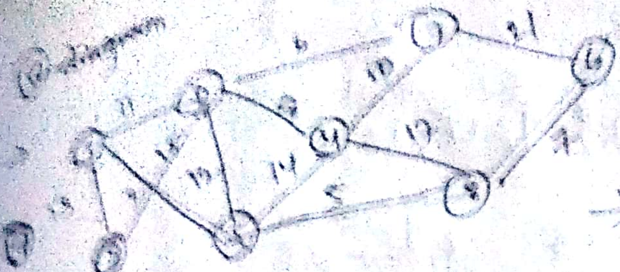
(b) diagram



$\rightarrow 62$ // (or) 52

Solution

(i) $n=5$ $m=17$ $P_i = (20, 15, 10, 5, 1)$ & $w_i = (7, 3, 4, 2, 5)$

$x_1 = 1$ $w_1 = 7$ $M = 17$ (total place left $17 - 7 = 10$)

$x_2 = \dfrac{\text{total place left}}{\text{weight of an item}} = \dfrac{10}{5} = 2$

$x_3 = \dfrac{2}{4} = \dfrac{1}{2}$ $x_4 = 0$ $x_5 = 0$

$\sum_{1 \le i \le n} P_i x_i = P_1x_1 + P_2x_2 + P_3x_3 + P_4x_4 + P_5x_5$

$= (20)(1) + (15)(2) + (10)\left(\frac{1}{2}\right)$

$= 20 + 30 + 5 = 55$ //

(ii) $\dfrac{P_1}{W_1} = \dfrac{20}{7} = 2.8$ $\dfrac{P_2}{W_2} = \dfrac{15}{3} = 5$ $\dfrac{P_3}{W_3} = \dfrac{10}{4} = 2.5$ ↑ Max

$\dfrac{P_4}{W_4} = \dfrac{5}{2} = 2.5$ $\dfrac{P_5}{W_5} = \dfrac{1}{5} = 0.2$

$x = 1$ $(17 - 3 = 14)$ $x_2 = \dfrac{14}{7} = 2$

$x_3 =$

$3+7+4+2$ $15 + 20 + 10 + 5 + \dfrac{1}{5} \times 1$

$+ \dfrac{1}{5} = 50.2$ //

(3) 20, 15, 8, 12, 6, 13, 22, 5, 9, 7

<u>Ascending</u>: 5, 6, 7, 8, 9, 12, 13, 15, 20, 22

T_0	5	8	13	22
T_1	6	9	15	
T_2	7	12	20	

$T_0 = 5 + (5+8) + (5+8+13) + (5+8+13+22)$

$= 92$ //

$T_1 = 6 + (6+9) + (6+9+15)$

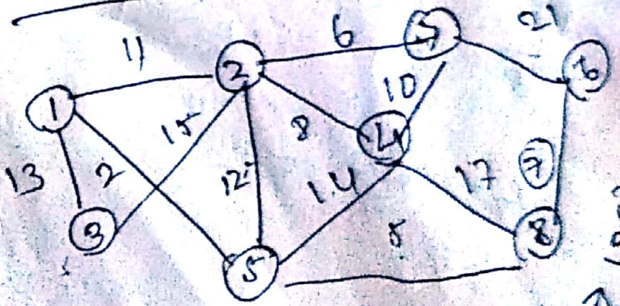
$= 51$ //

$T_2 = 7 + (7+12) + (7+12+20)$

$= 65$ //

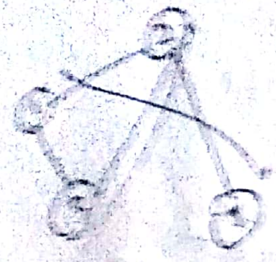
T_1 is Minimum.

(4) <u>Krushal's algorithm</u>

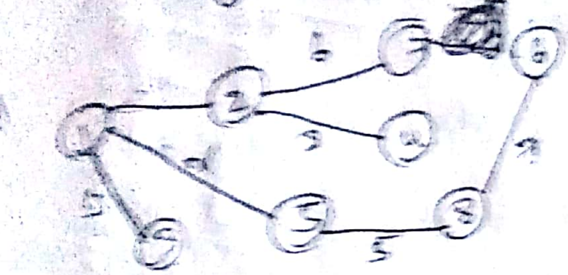


(2,3) = 15

…)=2
…8)=5
…7)=6
…6)=7
…4)=8
…)=10
…2)=11
(2,5)=12
(1,3)=13
(4,5)=14
(4,8)=17
(7,6)=21



Krsl

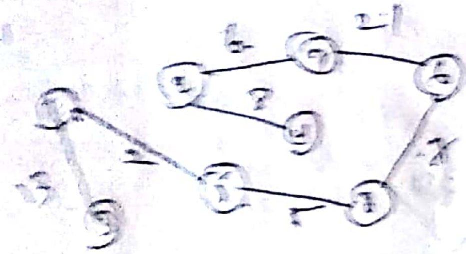


2+5+6+7+8

+13+11

= 52

Prim

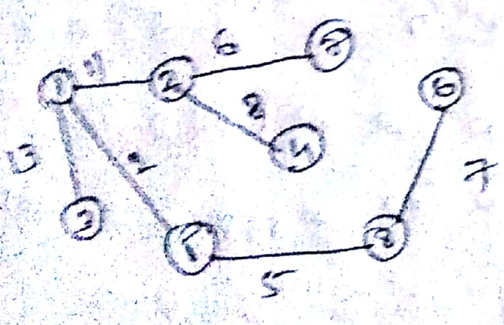


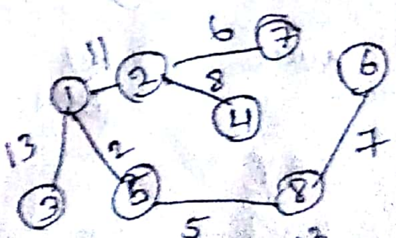
21+5+7+7+21+13

+ 6+8 = 62

5

Iteration	S	vertex selected	distance ①	②	③	④	⑤	⑥	⑦	⑧
Initial	{5}	—	∞	∞	∞	1500	0	250	∞	∞
			∞	∞	∞	1500	0	250	∞	∞
1	{5}									
2	{5,4}	3								





52

(6) sequence profit possible sequence

Given deadline is 4. highest.

descending

30

20

18

6

3

1

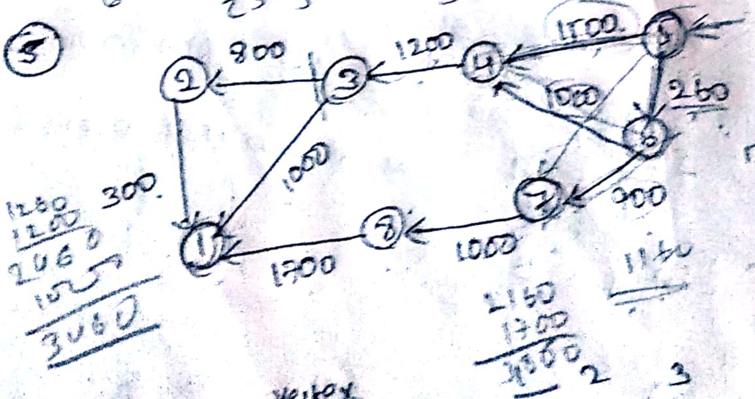
(1,2,3,4) 30+20+18+6 = 74

30+20+18+6

1	{7}	7	30
2	{3,7}	7,3	50
3	{4,3,7}	7,4,3	68
4	{3,4,6,7}	6,7,4,3	74
5	{7}	7	30
6	{3}	3	20

⇒ 74

(5)



1200
1200
1000
3260

Source | Vertex Selected | 2 3 4 5 6 7 8

5 — ∞ ∞ ∞ 1500 0 250 ∞ ∞

{5} — 6 — ∞ ∞ ∞ 1500 0 250 1150 ∞

0

0

Source | Vertex

Source	Vertex
5	
5,6	6
5,6,7	7
5,6,7,4	4
5,6,7,4,8	8
5,6,7,4,8,3	3
5,6,7,4,8,3,1	1

(6) Mergesort

5 | 4 | 3 | 2

5 | 4 3 | 2

4 | 5 2 | 3

2 | 3 | 4 | 5

quicksort

Source	Vertex	1	2	3	4	5	6	7	8
5		∞	∞	∞	1500	0	250	∞	∞
5,6	6	∞	∞	∞	~~1500~~ 1260	0	260	1160	∞
5,6,7	7	∞	∞	∞	1260	0	260	1160	1260
5,6,7,4	4	∞	∞	2460	1260	0	260	1160	1260
5,6,7,4,8	8	~~∞~~ 2960 3460	∞	2460	1260	0	260	1160	1260
5,6,7,4,8,3	3	2960 3460	3260	2460	1260	0	260	1160	1260
5,6,7,4,8,3,1	1	2960 3460	3260	2460	1260	0	260	1160	1260

//

(6) **Mergesort**

| 5 | 4 | 3 | 2 | 5 | 8 | 9 |

| 5 | 4 | 3 | 2 | | 5 | 8 | 9 |

| 5 | 4 | | 3 | 2 | | 5 | 8 | | 9 |

| 4 | 5 | | 2 | 3 | | 5 | 8 | | 9 |

| 2 | 3 | 4 | 5 | | 5 | 8 | 9 |

| 2 | 3 | 4 | 5 | 5 | 8 | 9 | → Sorted list

quicksort

M

5 4 3 2 5 8 9

Pivot

4 3 2 5 | 5 8 9

P

2 3 4 5 5 8 9