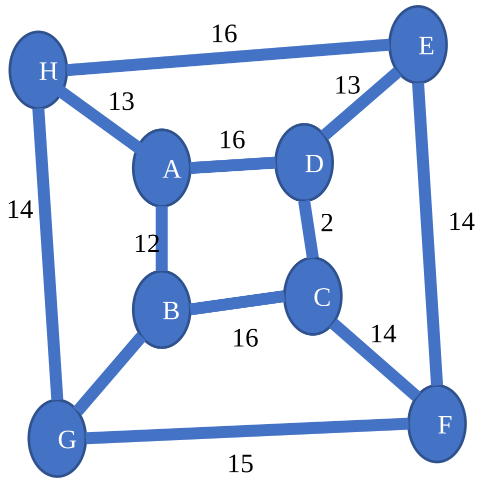
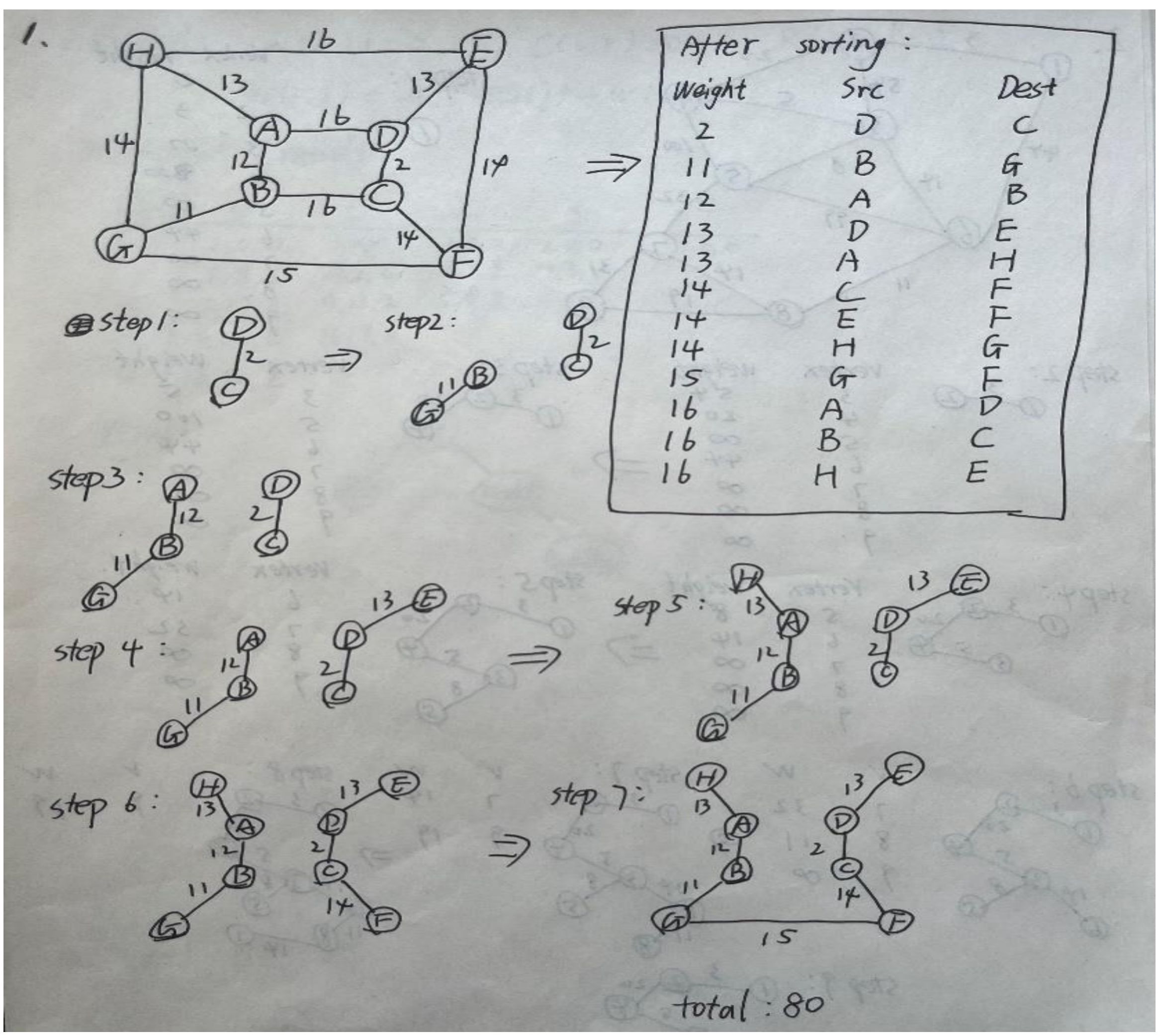
Sample question for Advanced Algorithm Analysis And Design

- Dear student_ Please note that the answers provided for this document are intended as guidelines and may contain errors.
- We encourage you to review them carefully and report any identified errors.

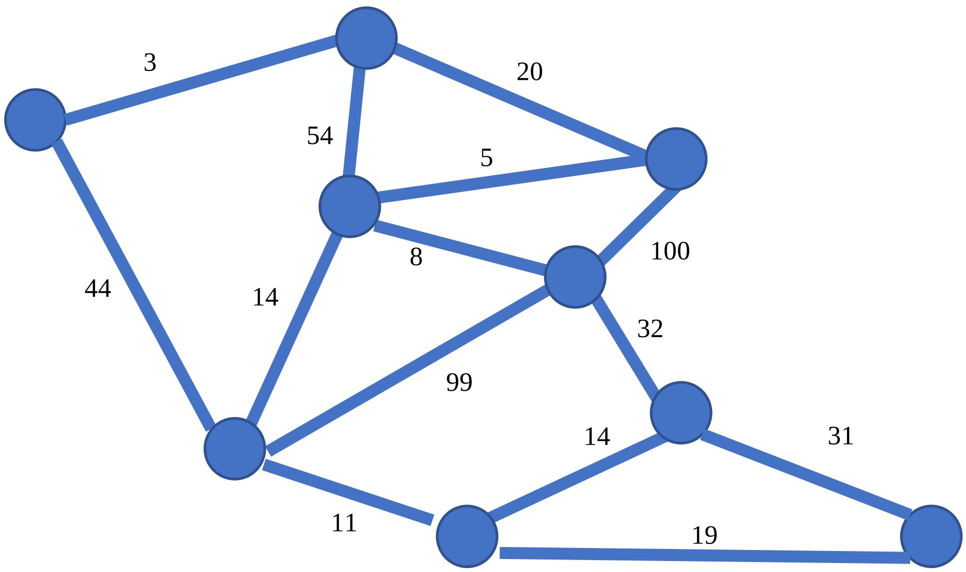
1. Apply the Kruskal's algorithm on the below graph to form a minimal spanning tree(MST) and show your results in tabular form as well.



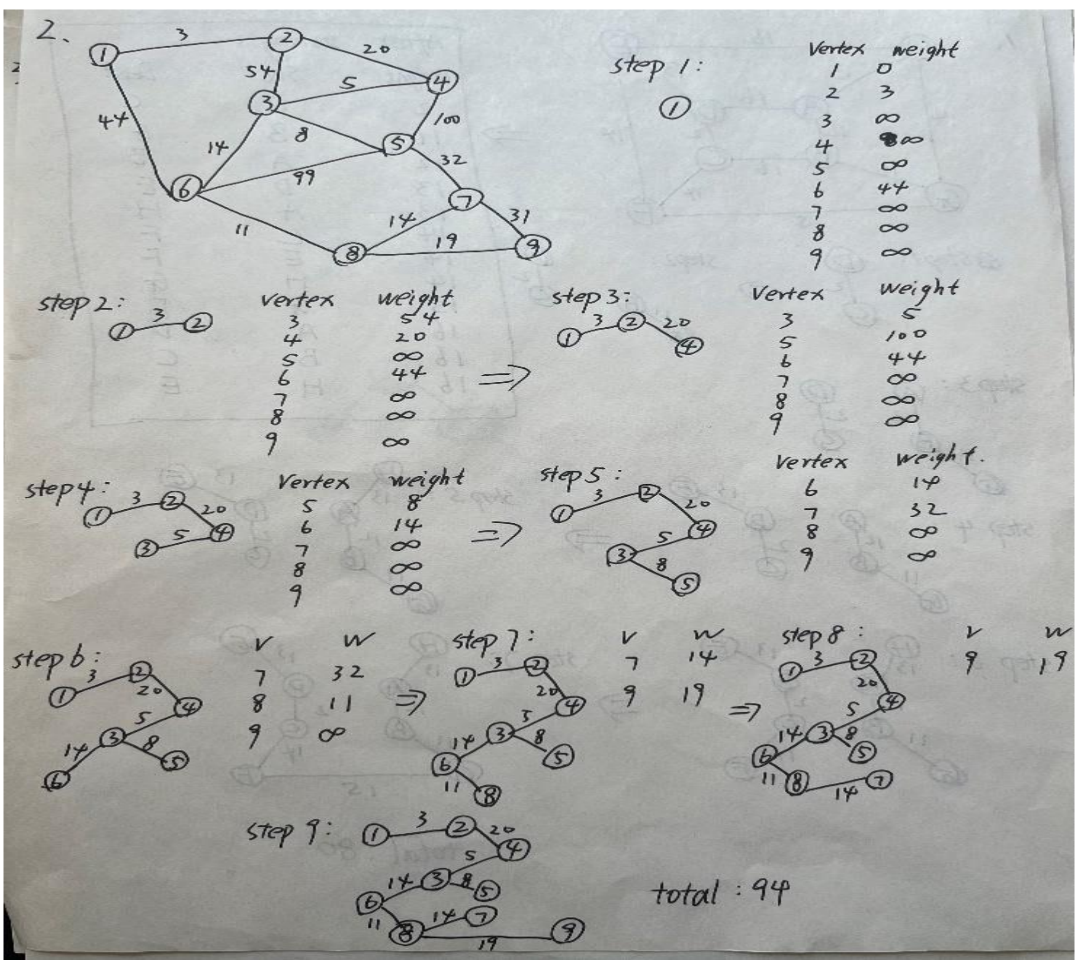
Question 1 Answer:



2. write down the prims algorithm and apply your algorithm on the following graph to form a minimal spanning tree(MST) show your results in tabular form as well .

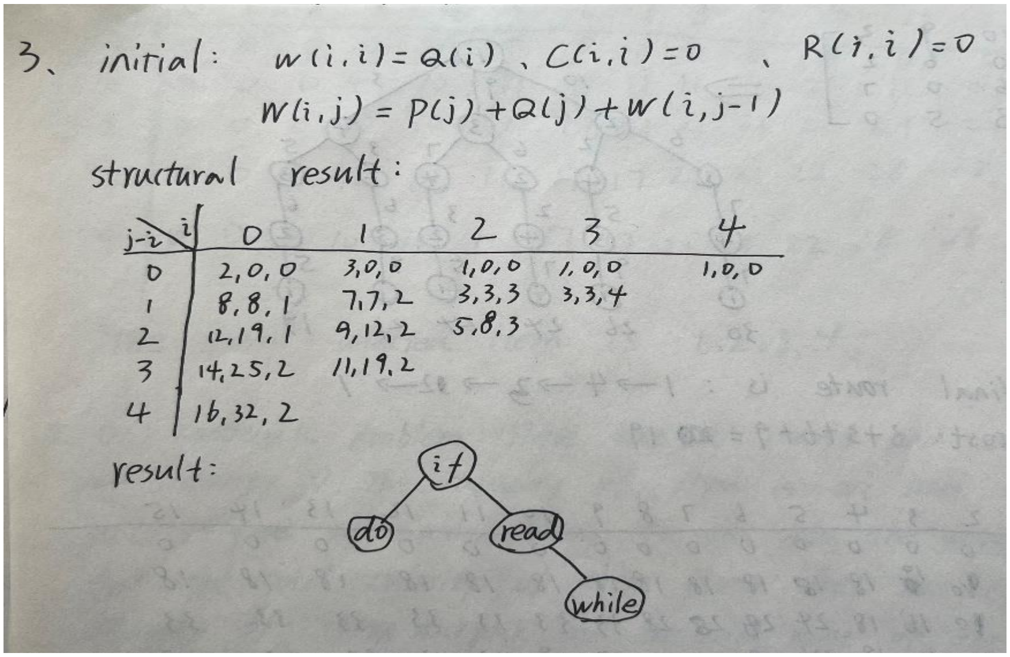


Question 2 Answer:



3. Draw an Optimal Binary Search Tree for n=4 identifiers (a1,a2,a3,a4) = (do,if, read, while) P(1:4)=(3,3,1,1) and Q(0:4)=(2,3,1,1,1).

Question 3 Answer:



3、 initial: $w(i,i)=Q(i)$ 、$C(i,i)=0$ 、$R(i,i)=0$

$W(i,j) = P(j)+Q(j)+W(i,j-1)$

structural result:

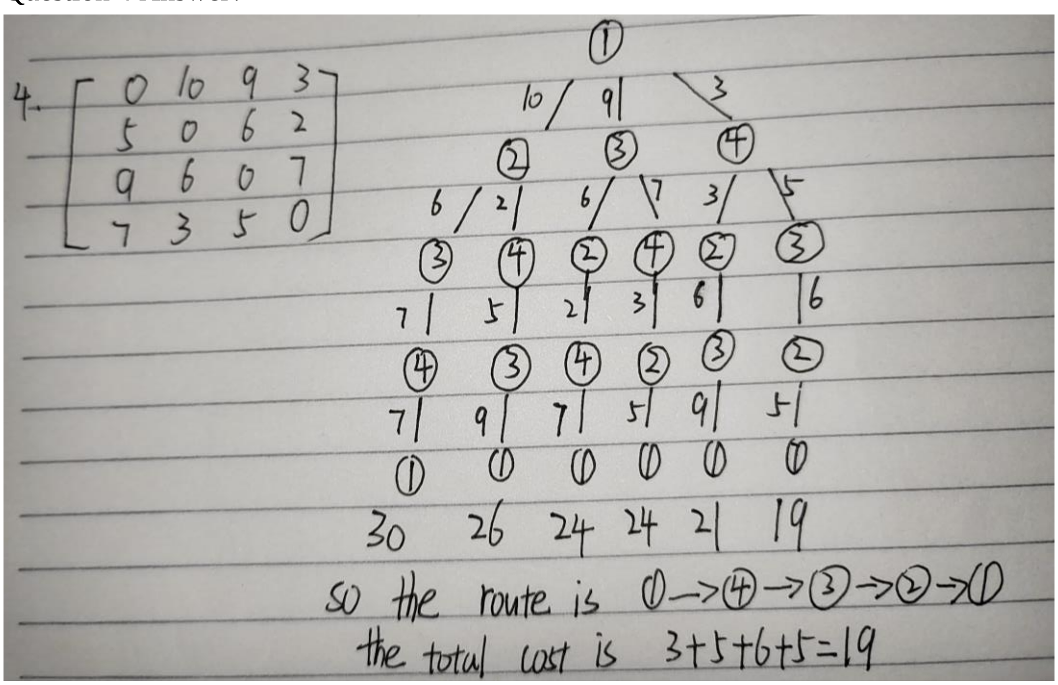
j-i \ i	0	1	2	3	4
0	2,0,0	3,0,0	1,0,0	1,0,0	1,0,0
1	8,8,1	7,7,2	3,3,3	3,3,4	
2	12,19,1	9,12,2	5,8,3		
3	14,25,2	11,19,2			
4	16,32,2				

result:

4. Construct an optimal travelling sales person tour using Dynamic Programming.

0	10	9	3
5	0	6	2
9	6	0	7
7	3	5	0

Question 4 Answer:



so the route is 1->4->3->2->1

the total cost is 3+5+6+5=19

5. Find an optimal solution to the knapsack instance n=7 objects and the capacity of knapsack m=15. The profits and weights of the objects are (P1,P2,P3, P4, P5, P6, P7)= (10, 5,15,7,6,18,3) (W1,W2,W3,W4,W5,W6,W7)= (2,3,5,7,1,4,1)

Question 5 Answer:

No: Date:

5.

n \ m	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	6	10	10	18	18	18	18	18	18	18	18	18	18	18	18
2	0	6	10	16	18	24	28	28	28	33	33	33	33	33	33	33
3	0	6	10	16	19	24	28	34	34	34	39	43	43	43	43	43
4	0	6	10	16	19	24	28	34	37	37	39	43	49	49	49	49
5	0	6	10	16	19	24	28	34	37	37	39	43	52	52	52	54
6	0	6	10	16	19	24	28	34	37	37	39	43	52	52	52	54
7	0	6	10	16	19	24	28	34	37	37	39	43	52	52	52	54

the final selected item is 1, 2, 3, 5, 6

6. Find an optimal solution to the knapsack instance n=4 objects and the capacity of knapsack m=15, profits (10, 5, 7, 11) and weight are (3, 4, 3, 5).

Question 6 Answer:

6.

n \ m	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	10	10	11	11	11	11	11	11	11	11	11	11	11
2	0	0	0	10	10	11	17	17	21	21	21	21	21	21	21	21
3	0	0	0	10	10	11	17	17	21	21	22	28	28	28	28	28
4	0	0	0	10	10	11	17	17	21	21	22	28	28	28	28	$\boxed{33}$

The final selected item is : 1.2.3.4

7. Describe the Dynamic 0/1 Knapsack Problem. Find an optimal solution for the dynamic programming 0/1 knapsack instance for n=3, m=6, profits are (p1, p2, p3) = (1,2,5), weights are (w1,w2,w3)=(2,3,4).
Question 7 Answer:

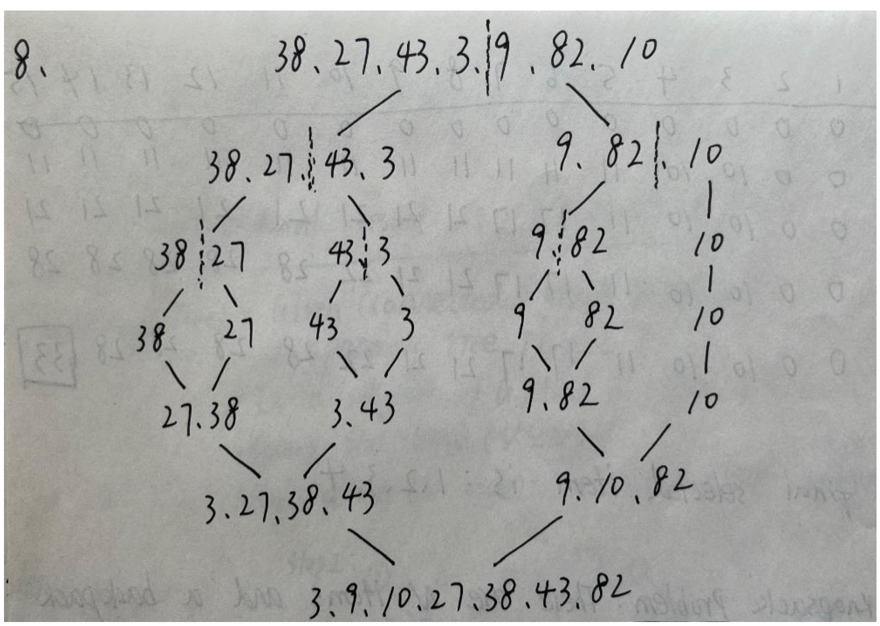
7、0/1 Knapsack Problem: There are N items and a backpack of capacity V. The capacity of item is w_i and the value is c_i. Figure out which items to put into the backpack so that the total capacity of these items does not exceed the capacity of the backpack, and the total value of the maximum.

n \ m	0	1	2	3	4	5	6
0	0	0	0	0	0	0	0
1	0	0	1	2	5	5	5
2	0	0	1	2	5	5	6
3	0	0	1	2	5	5	$\boxed{6}$

The final selected item is: 1、3

8. Show the result of running Merge sorting technique on the sequence 38,27,43,3,9,82,10

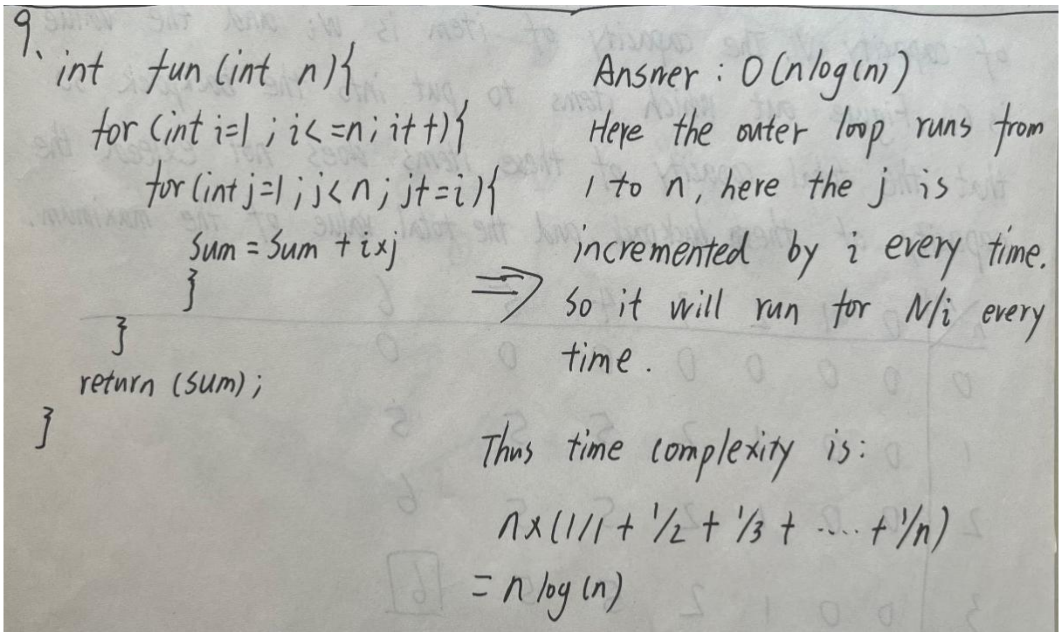
Question 8 Answer:



9. What is the time complexity of following function fun ()? Explain

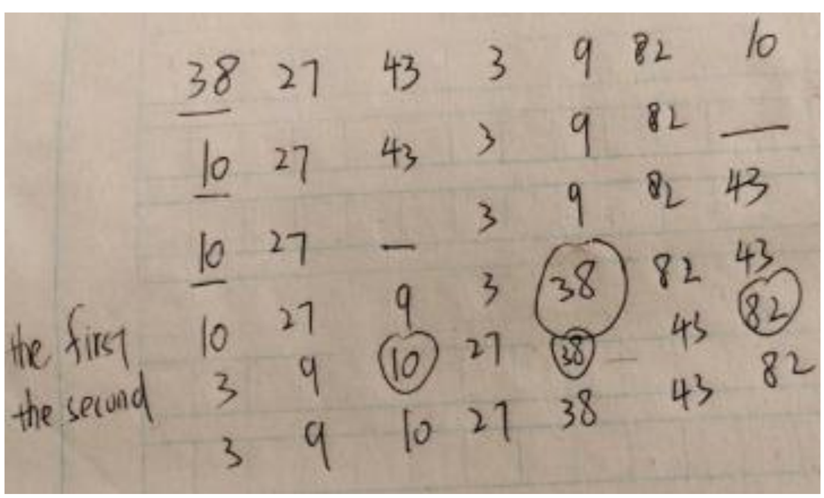
```
int fun(int n) {
for (int i = 1; i <= n; i++) {
for (int j = 1; j < n; j += i) {
Sum = Sum +i*j;
}
}
return(Sum);
}
```

Question 9 Answer:



10. Show the result of runnthe ing Quick sorting technique on the sequence 38,27,43,3,9,82,10.

Question 10 Answer:



11. Use an algorithm for greedy strategies for the knapsack to find an optimal solution to the knapsack instance n=7,m=15,(p1,p2….,p7)=(10,5,15,7,6,18,3),and (w1,w2,…w7)=(2,3,5,7,1,4,1).

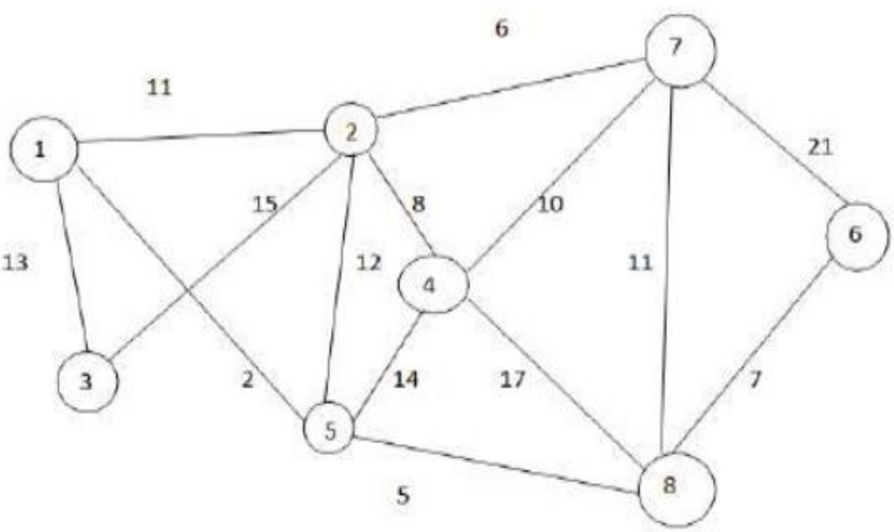
Question 11 Answer:

11.

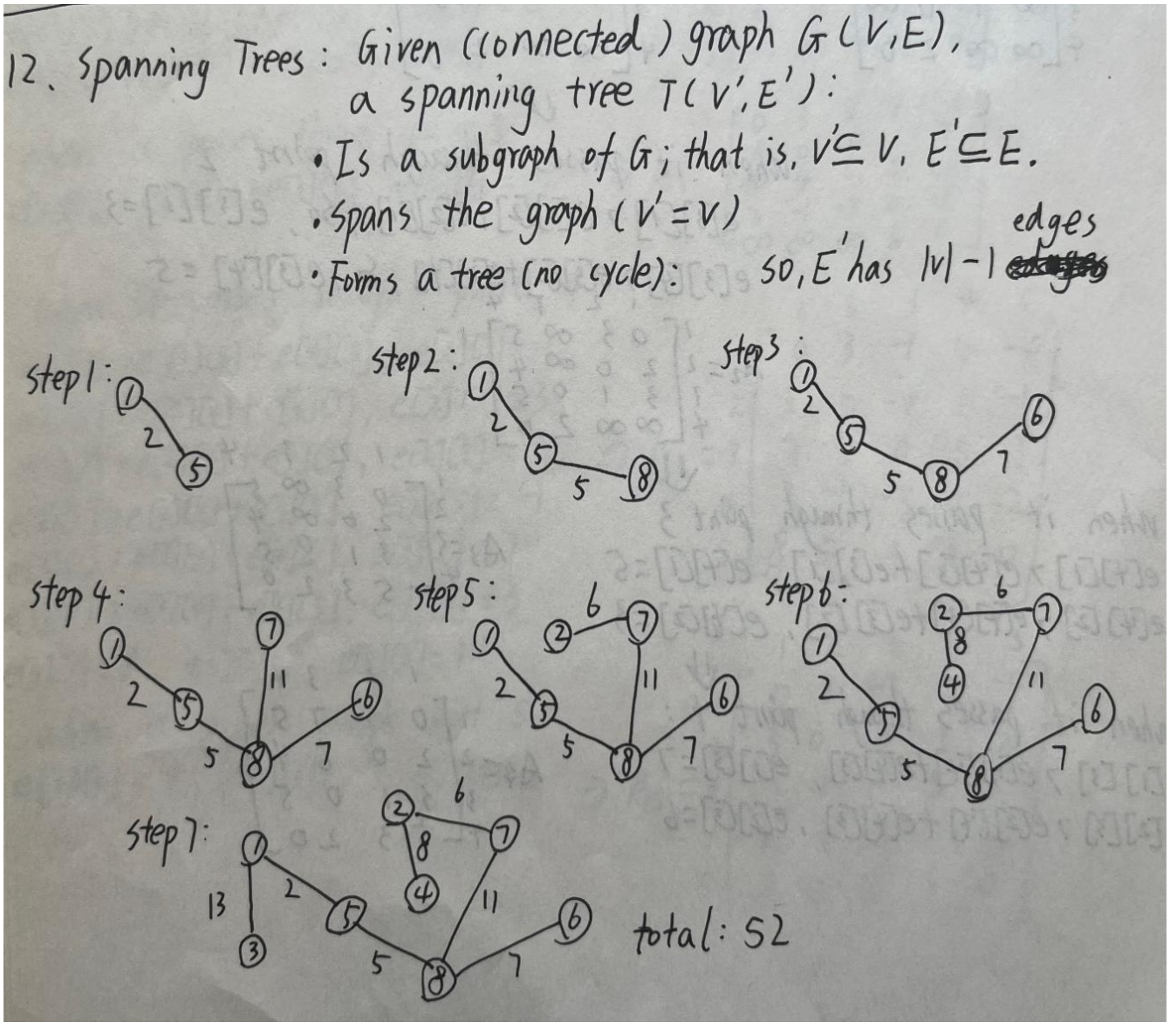
n \ m	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	6	10	10	18	18	18	18	18	18	18	18	18	18	18	18
2	0	6	10	16	18	24	28	28	28	33	33	33	33	33	33	33
3	0	6	10	16	19	24	28	34	34	34	39	43	43	43	43	43
4	0	6	10	16	19	24	28	34	37	37	39	43	49	49	49	49
5	0	6	10	16	19	24	28	34	37	37	39	43	49	49	49	54
6	0	6	10	16	19	24	28	34	37	37	39	43	49	49	49	54
7	0	6	10	16	19	24	28	34	37	37	39	43	49	49	49	$\boxed{54}$

The final selected item is: 1、2、3、5、6

12. Define the spanning tree. Compute a minimum cost spanning tree for the graph of figure using prim’s algorithm.



Question 12 Answer:

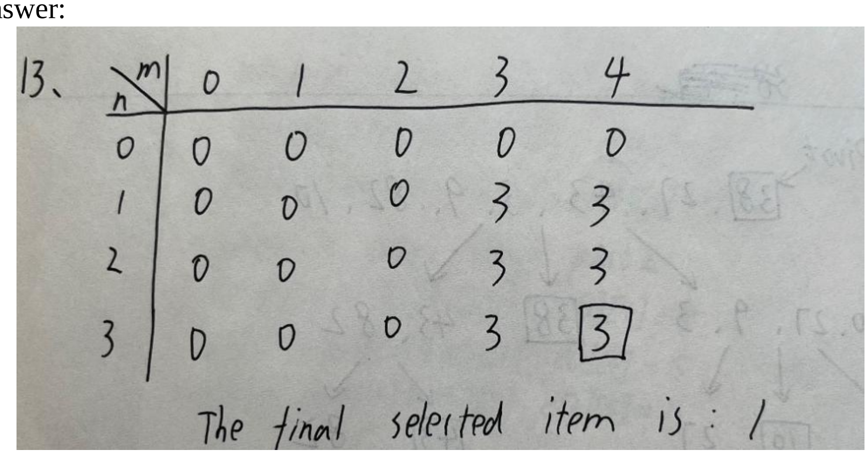


12、Spanning Trees: Given (connected) graph $G(V,E)$, a spanning tree $T(V',E')$:

- Is a subgraph of G; that is, $V' \subseteq V$, $E' \subseteq E$.
- Spans the graph ($V' = V$)
- Forms a tree (no cycle): so, E' has $|V|-1$ edges

13. Solve the following instance of 0/1 Knapsack problem using Dynamic programming n = 3; (W1, W2, W3) = (3, 5, 7); (P1, P2, P3) = (3, 7, 12); M = 4

Question 13 Answer:

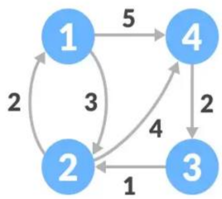


13、

n \ m	0	1	2	3	4
0	0	0	0	0	0
1	0	0	0	3	3
2	0	0	0	3	3
3	0	0	0	3	$\boxed{3}$

The final selected item is: 1

14. Apply Floyd-Warshall algorithm for constructing the shortest path.



Question 14 Answer:

14. Initial matrix:

$$A = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{c} \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{bmatrix} 0 & 3 & \infty & 5 \\ 2 & 0 & \infty & 4 \\ \infty & 1 & 0 & \infty \\ \infty & \infty & 2 & 0 \end{bmatrix} \end{array} \Rightarrow$$

when it passes through point 1,

$$A_1 = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{c} \begin{array}{cccc} & 2 & 3 & 4 \end{array} \\ \begin{bmatrix} 0 & 3 & \infty & 5 \\ 2 & 0 & \infty & 4 \\ \infty & 1 & 0 & \infty \\ \infty & \infty & 2 & 0 \end{bmatrix} \end{array}$$

$\Downarrow$

when it passes through point 2

$e[3][1] > e[3][2] + e[2][1]$, So, $e[3][1] = 3$

$e[3][4] > e[3][2] + e[2][4]$, So, $e[3][4] = 5$

$$A_2 = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{c} \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{bmatrix} 0 & 3 & \infty & 5 \\ 2 & 0 & \infty & 4 \\ 3 & 1 & 0 & 5 \\ \infty & \infty & 2 & 0 \end{bmatrix} \end{array}$$

$\Downarrow$

when it passes through point 3

$e[4][1] > e[4][3] + e[3][1]$, $e[4][1] = 5$

$e[4][2] > e[4][3] + e[3][2]$, $e[4][2] = 3$

$$A_3 = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{c} \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{bmatrix} 0 & 3 & \infty & 5 \\ 2 & 0 & \infty & 4 \\ 3 & 1 & 0 & 5 \\ 5 & 3 & 2 & 0 \end{bmatrix} \end{array}$$

$\Downarrow$

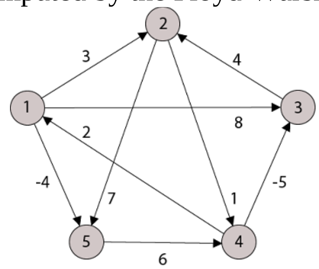
when it passes through point 4:

$e[1][3] > e[1][4] + e[4][3]$, $e[1][3] = 7$

$e[2][3] > e[2][4] + e[4][3]$, $e[2][3] = 6$

$$A_4 = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{c} \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{bmatrix} 0 & 3 & 7 & 5 \\ 2 & 0 & 6 & 4 \\ 3 & 1 & 0 & 5 \\ 5 & 3 & 2 & 0 \end{bmatrix} \end{array}$$

15.Apply Floyd-Warshall algorithm for constructing the shortest path. Show that matrices D(k) and π(k) computed by the Floyd-Warshall algorithm for the graph.



Question 15 Answer:

15. Initial matrix:

$$A=\begin{array}{c@{}c} & \begin{array}{ccccc}1&2&3&4&5\end{array}\\ \begin{array}{c}1\\2\\3\\4\\5\end{array} & \begin{bmatrix}0&3&8&\infty&-4\\ \infty&0&\infty&1&7\\ \infty&4&0&\infty&\infty\\ 2&\infty&-5&0&\infty\\ \infty&\infty&\infty&6&0\end{bmatrix}\end{array}$$

when it passes through point 1:

e[4][2] > e[4][1]+e[1][2], e[4][2]=5

e[4][5] > e[4][1]+e[1][5], e[4][5]=-2

$$\Rightarrow A_1=\begin{array}{c@{}c} & \begin{array}{ccccc}1&2&3&4&5\end{array}\\ \begin{array}{c}1\\2\\3\\4\\5\end{array} & \begin{bmatrix}0&3&8&\infty&-4\\ \infty&0&\infty&1&7\\ \infty&4&0&\infty&\infty\\ 2&5&-5&0&-2\\ \infty&\infty&\infty&6&0\end{bmatrix}\end{array}$$

when it passes through point 2:

e[1][4] > e[1][2]+e[2][4], e[1][4]=4

e[3][4] > e[3][2]+e[2][4], e[3][4]=5

e[3][5] > e[3][2]+e[2][5], e[3][5]=11

$$\Rightarrow A_2=\begin{array}{c@{}c} & \begin{array}{ccccc}1&2&3&4&5\end{array}\\ \begin{array}{c}1\\2\\3\\4\\5\end{array} & \begin{bmatrix}0&3&8&4&-4\\ \infty&0&\infty&1&7\\ \infty&4&0&5&11\\ 2&5&-5&0&-2\\ \infty&\infty&\infty&6&0\end{bmatrix}\end{array}$$

when it passes through point 3:

e[4][2] > e[4][3]+e[3][2], e[4][2]=-1

$$\Rightarrow A_3=\begin{bmatrix}0&3&8&4&-4\\ \infty&0&\infty&1&7\\ \infty&4&0&5&11\\ 2&-1&-5&0&-2\\ \infty&\infty&\infty&6&6\end{bmatrix}$$

when it passes through point 4:

e[1][3] > e[1][4]+e[4][3], e[1][3]=-1

e[2][1] > e[2][4]+e[4][1], e[2][1]=3

e[2][3] > e[2][4]+e[4][3], e[2][3]=-4

e[2][5] > e[3][4]+e[4][5], e[2][5]=-1

e[3][1] > e[3][4]+e[4][1], e[3][1]=7

e[3][5] > e[3][4]+e[4][5], e[3][5]=3

e[5][1]=8, e[5][2]=5, e[5][3]=1

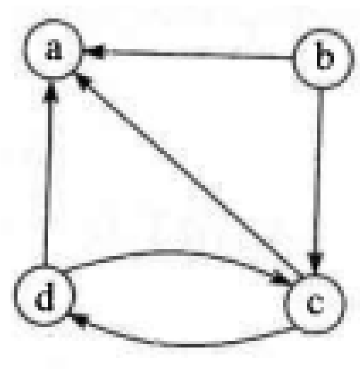
$$\Rightarrow A_4=\begin{array}{c@{}c} & \begin{array}{ccccc}1&2&3&4&5\end{array}\\ \begin{array}{c}1\\2\\3\\4\\5\end{array} & \begin{bmatrix}0&3&-1&4&-4\\ 3&0&-4&1&-1\\ 7&4&0&5&3\\ 2&-1&-5&0&-2\\ 8&5&1&6&0\end{bmatrix}\end{array}$$

when it passes through point 5:

e[1][2]=1, e[1][3]=-3, e[1][4]=2

$$\Rightarrow A_5=\begin{array}{c@{}c} & \begin{array}{ccccc}1&2&3&4&5\end{array}\\ \begin{array}{c}1\\2\\3\\4\\5\end{array} & \begin{bmatrix}0&1&-3&2&-4\\ 3&0&-4&1&-1\\ 7&4&0&5&3\\ 2&-1&-5&0&-2\\ 8&5&1&6&0\end{bmatrix}\end{array}$$

16. Apply Floyd-Warshall algorithm to find the transitive closure of following graph



Question 16 Answer:

16、Initial matrix:

$$A = \begin{array}{c|cccc} & a & b & c & d \\ \hline a & 0 & 0 & 0 & 0 \\ b & 1 & 0 & 1 & 0 \\ c & 1 & 0 & 0 & 1 \\ d & 1 & 0 & 1 & 0 \end{array}$$

step 1: $k=1$

$$A_1 = \begin{array}{c|cccc} & a & b & c & d \\ \hline a & 0 & 0 & 0 & 0 \\ b & 1 & 0 & 1 & 0 \\ c & 1 & 0 & 0 & 1 \\ d & 1 & 0 & 1 & 0 \end{array}$$

step 2: $k=2$

$$A_2 = \begin{array}{c|cccc} & a & b & c & d \\ \hline a & 0 & 0 & 0 & 0 \\ b & 1 & 0 & 1 & 0 \\ c & 1 & 0 & 0 & 1 \\ d & 1 & 0 & 1 & 0 \end{array}$$

step 3: $k=3$

$e[b][d]=1$, $e[d][d]=1$

$$A_3 = \begin{array}{c|cccc} & a & b & c & d \\ \hline a & 0 & 0 & 0 & 0 \\ b & 1 & 0 & 1 & 1 \\ c & 1 & 0 & 0 & 1 \\ d & 1 & 0 & 1 & 1 \end{array}$$

step 4: $k=4$

$e[c][c]=1$

$$A_4 = \begin{array}{c|cccc} & a & b & c & d \\ \hline a & 0 & 0 & 0 & 0 \\ b & 1 & 0 & 1 & 1 \\ c & 1 & 0 & 1 & 1 \\ d & 1 & 0 & 1 & 1 \end{array}$$

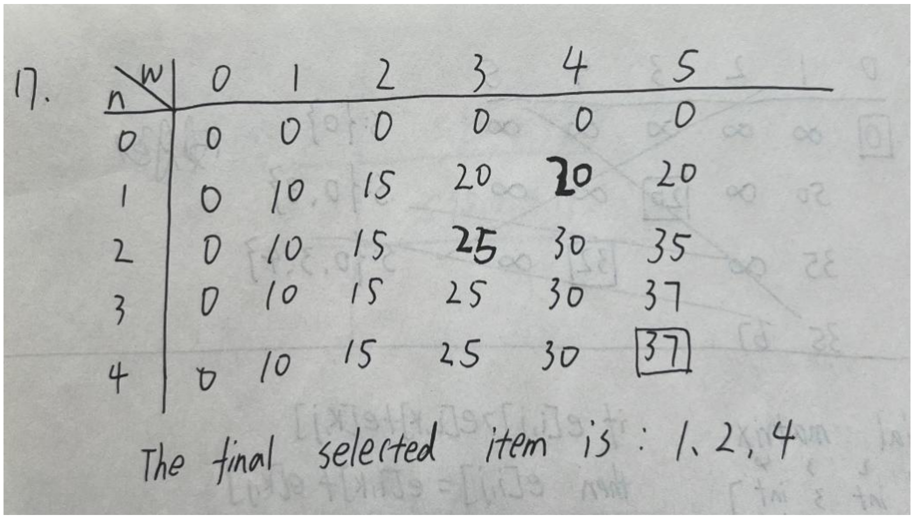
The transitive closure matrix is:

$$A_4 = \begin{array}{c|cccc} & a & b & c & d \\ \hline a & 0 & 0 & 0 & 0 \\ b & 1 & 0 & 1 & 1 \\ c & 1 & 0 & 1 & 1 \\ d & 1 & 0 & 1 & 1 \end{array}$$

17. Solve the following knapsack problem with the given capacity w=5 using dynamic programming

Item	Weight	Value
1	2	12 RMB
2	1	10 RMB
3	3	20 RMB
4	2	15 RMB

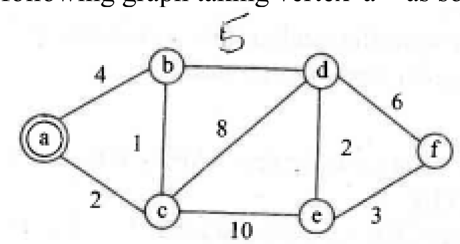
Question 17 Answer:


17.

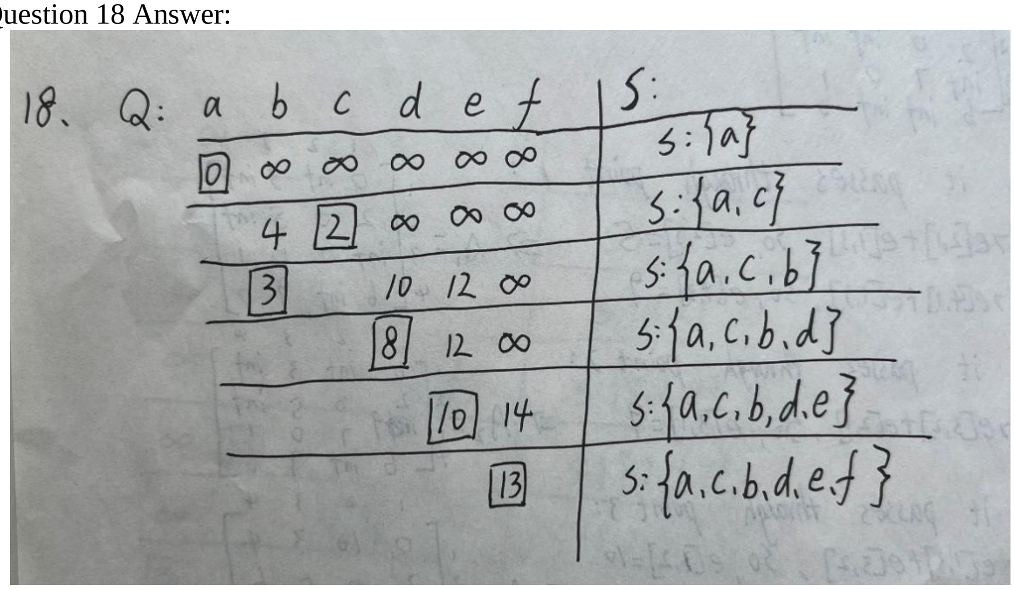
n \ w	0	1	2	3	4	5
0	0	0	0	0	0	0
1	0	10	15	20	20	20
2	0	10	15	25	30	35
3	0	10	15	25	30	37
4	0	10	15	25	30	$\boxed{37}$

The final selected item is : 1, 2, 4

18. Write DIJKSTRAS algorithm and apply the same to find single source shortest paths problem for following graph taking vertex”a”’ as source in bellow figure.

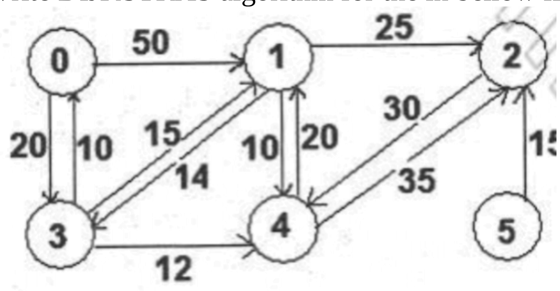


Question 18 Answer:


18.

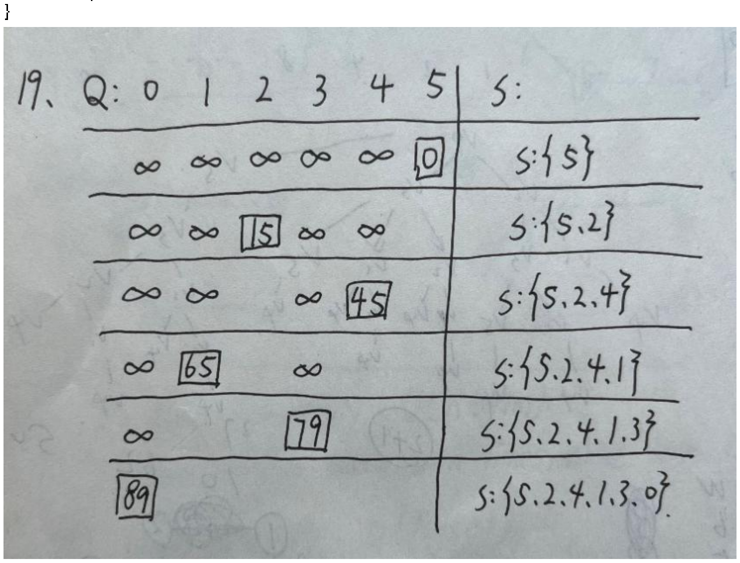
Q: a	b	c	d	e	f	S:
$\boxed{0}$	∞	∞	∞	∞	∞	S:{a}
	4	$\boxed{2}$	∞	∞	∞	S:{a,c}
	$\boxed{3}$		10	12	∞	S:{a,c,b}
			$\boxed{8}$	12	∞	S:{a,c,b,d}
				$\boxed{10}$	14	S:{a,c,b,d,e}
					$\boxed{13}$	S:{a,c,b,d,e,f}

19. Write DIJKSTRAS algorithm for the in bellow figure



Question 19 Answer:

```
#include <limits.h>
#include <stdio.h>
#define V 6
int minDistance(int dist[], bool sptSet[]){
int min = INT_MAX, min_index;
for (int v = 0; v < V; v++)
if (sptSet[v] == false && dist[v] <= min)
min = dist[v], min_index = v;
return min_index;
}
int printSolution(int dist[], int n){
printf("Vertex Distance from Source\n");
for (int i = 0; i < V; i++)
printf("%d \t\t %d\n", i, dist[i]);
}
void dijkstra(int graph[V][V], int src){
int dist[V];
bool sptSet[V];
for (int i = 0; i < V; i++)
dist[i] = INT_MAX, sptSet[i] = false;
dist[src] = 0;
for (int count = 0; count < V - 1; count++) {
int u = minDistance(dist, sptSet);
sptSet[u] = true;
for (int v = 0; v < V; v++)
if (!sptSet[v] && graph[u][v] && dist[u] != INT_MAX&& dist[u] + graph[u][v] < dist[v])
dist[v] = dist[u] + graph[u][v];
}
printSolution(dist, V);
}
int main(){
int graph[V][V] = {
{ 0, 50, 0, 20, 0, 0},
{ 0, 0, 25, 14, 10, 0},
{ 0, 0, 0, 0, 30, 0},
{ 10, 15, 0, 0, 12, 0},
{ 0, 20, 35, 0, 0, 0},
{ 0, 0, 15, 0, 0, 0}};
dijkstra(graph, 0);
return 0;
}
```



19、Q: 0	1	2	3	4	5	S:
∞	∞	∞	∞	∞	$\boxed{0}$	S:{5}
∞	∞	$\boxed{15}$	∞	∞		S:{5,2}
∞	∞		∞	$\boxed{45}$		S:{5,2,4}
∞	$\boxed{65}$		∞			S:{5,2,4,1}
∞			$\boxed{79}$			S:{5,2,4,1,3}
$\boxed{89}$						S:{5,2,4,1,3,0}

20. Write the formula to find the shortest path using Floyds approach. use floyd method to solve the following all pairs shortest paths problem.

0	inf	3	inf
2	0	inf	inf
inf	7	0	1
6	inf	inf	0

Question 20 Answer:

20. Initial matrix:

if $e[i,j] > e[i,k] + e[k,j]$

then $e[i,j] = e[i,k] + e[k,j]$

$$A = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{c} \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{bmatrix} 0 & int & 3 & int \\ 2 & 0 & int & int \\ int & 7 & 0 & 1 \\ 6 & int & int & 0 \end{bmatrix} \end{array}$$

when it passes through point 1:

$e[2,3] > e[2,1] + e[1,3]$, so, $e[2,3] = 5$

$e[4,3] > e[4,1] + e[1,3]$, so, $e[4,3] = 9$

$$\Rightarrow A_1 = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{c} \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{bmatrix} 0 & int & 3 & int \\ 2 & 0 & 5 & int \\ int & 7 & 0 & 1 \\ 6 & int & 9 & 0 \end{bmatrix} \end{array}$$

when it passes through point 2:

$e[3,1] > e[3,2] + e[2,1]$, so, $e[3,1] = 9$

$$\Rightarrow A_2 = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{c} \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{bmatrix} 0 & int & 3 & int \\ 2 & 0 & 5 & int \\ 9 & 7 & 0 & 1 \\ 6 & int & 9 & 0 \end{bmatrix} \end{array}$$

when it passes through point 3:

$e[1,2] > e[1,3] + e[3,2]$, so, $e[1,2] = 10$

$e[1,4] > e[1,3] + e[3,4]$, so, $e[1,4] = 4$

$e[2,4] > e[2,3] + e[3,4]$, so, $e[2,4] = 6$

$e[4,2] > e[4,3] + e[3,2]$, so, $e[4,2] = 16$

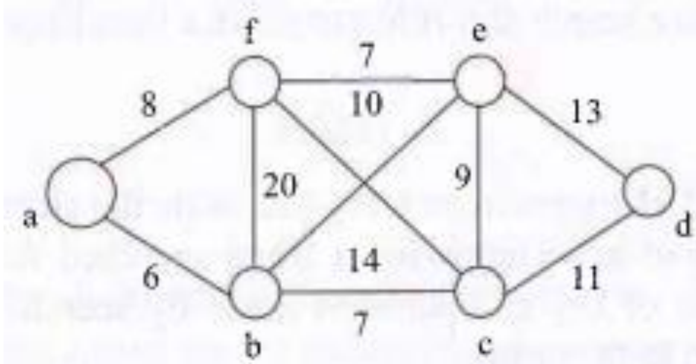
$$\Rightarrow A_3 = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{c} \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{bmatrix} 0 & 10 & 3 & 4 \\ 2 & 0 & 5 & 6 \\ 9 & 7 & 0 & 1 \\ 6 & 16 & 9 & 0 \end{bmatrix} \end{array}$$

when it passes through point 4:

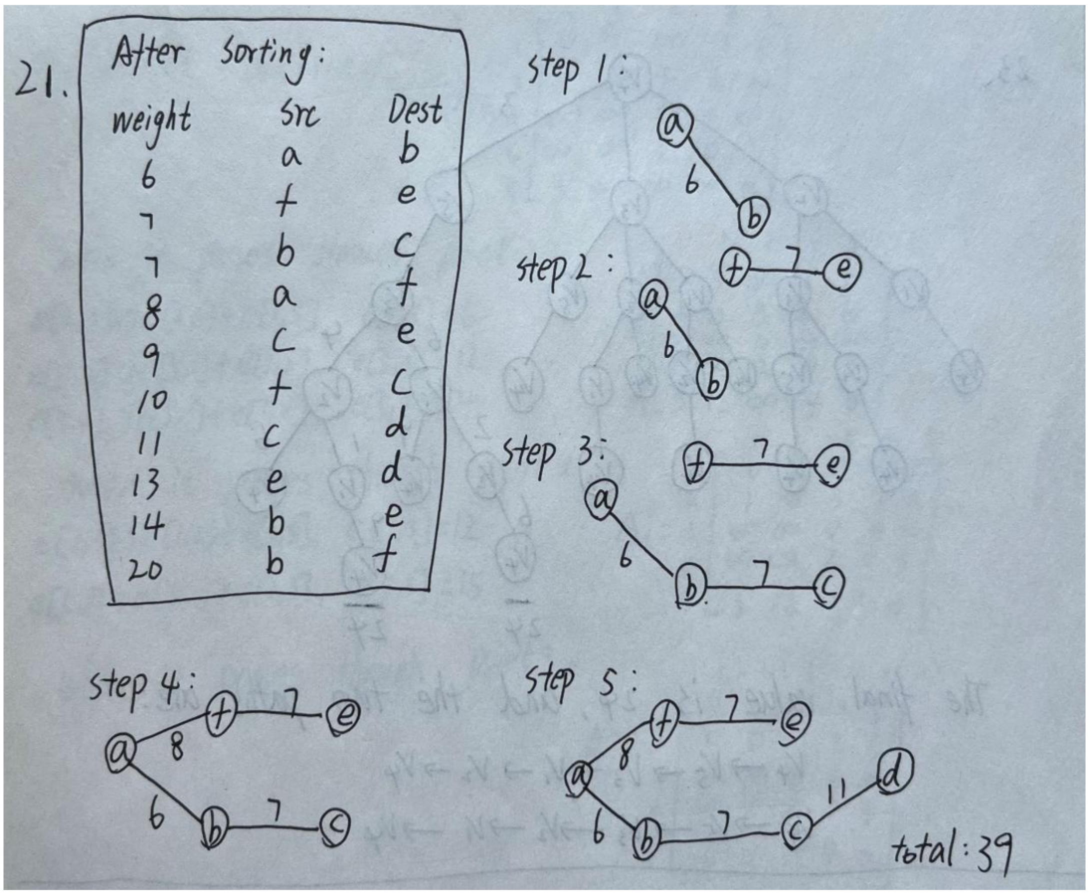
$e[3,1] > e[3,4] + e[4,1]$, so, $e[3,1] = 7$

$$\Rightarrow A_4 = \begin{array}{c} \\ 1 \\ 2 \\ 3 \\ 4 \end{array} \begin{array}{c} \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{bmatrix} 0 & 10 & 3 & 4 \\ 2 & 0 & 5 & 6 \\ 7 & 7 & 0 & 1 \\ 6 & 16 & 9 & 0 \end{bmatrix} \end{array}$$

21. Use Kruskals method to find min cost spanning tree for the following graph.



Question 21 Answer:



22. Define the time complexity for the bellow codes

A)
```
s=0;
for(i=0; i<=n; i++)
{ for(j=1;j<=n; j++)
      s++;
   k=1;
   while(k<n)
   { s++;
     k=k*2;
   } }
```

C)
```
For i=1 to n{
      J=1;
      While j<n;
      J=2*j;}
```

E)
```
sum=a=1;
for(i=1;i<=n;i++)
    for(j=1;j<=n;j++)
       {
       sum+=a;
       }
       print(sum);
```

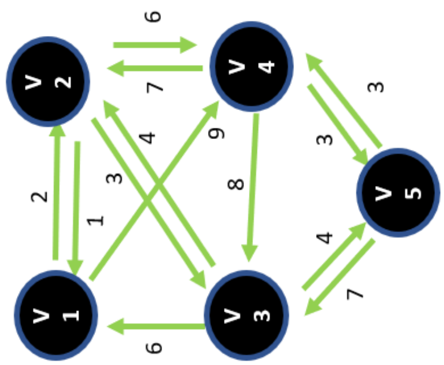
B)
```
int test (int a[] ; int  L, H)
{
    if (L == H)  return(a[L]);
    else
    {  t1= test (a[] , L , (L+H)/2);
       t2= test (a[] , ((L+H)/2)+1 , H );
       if (t1 >= t2 )    return(t1)
      else  return(t2);
     }
}
```

D)
```
int f(m , n)
{
    if ( n = = 1) return (m)  ;
    else return(m * f (m , n-1));
}
```

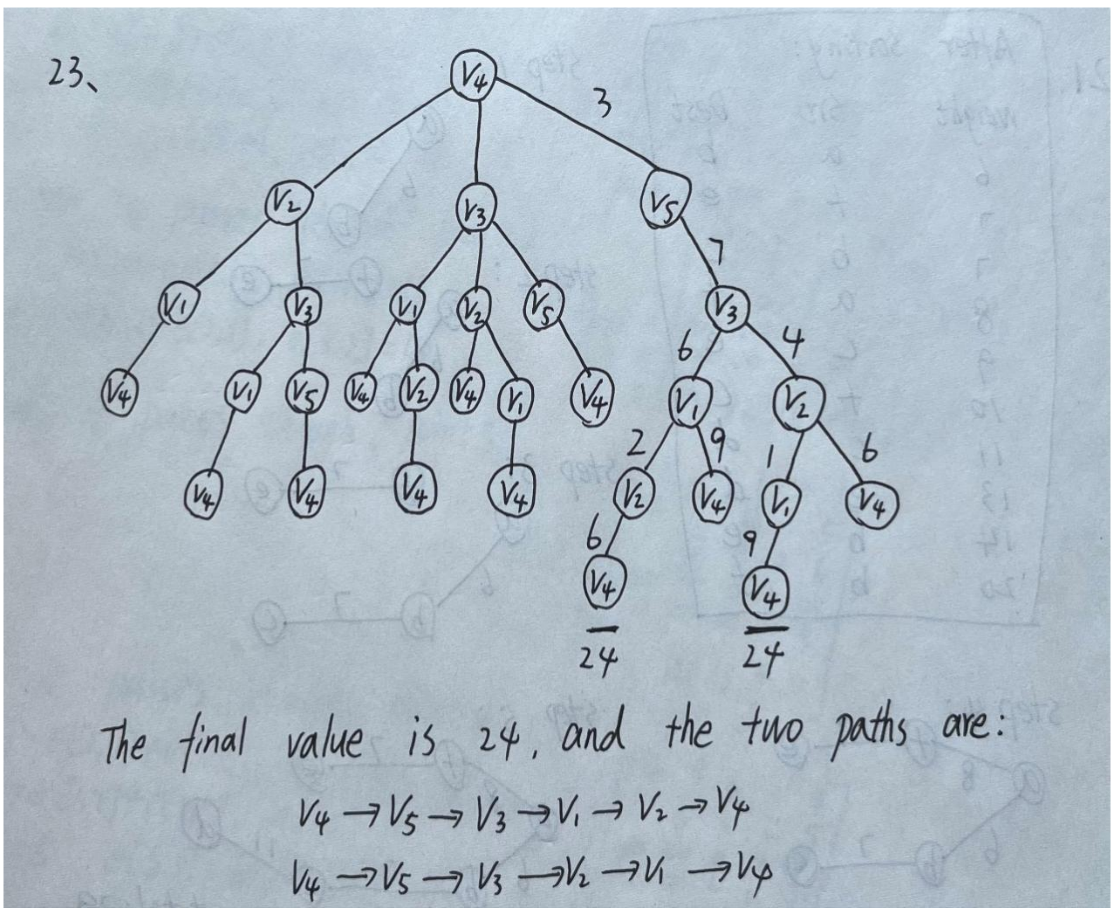
Question 22 Answer:

22、 A: Time complexity : $O(n^2 log(n))$
Two for loops execute n times, while loops execute log(n) times.
B: Time Complexity : O(log(n))
Half search time complexity is ~~log~~ log n
C: Time complexity : O(nlog(n))
The outer loop is n, and the inner while loop is logn.
D: Time complexity : O(n)
Recursive call n times
E: Time complexity : $O(n^2)$
The complexity of the two-layer for loop time is n^2

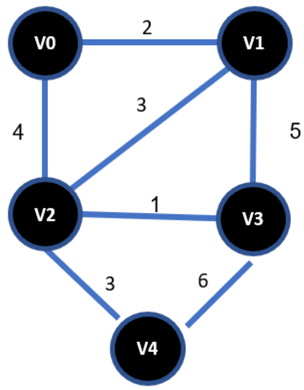
23. with respect to the TSP problem what's the value for D[V4][{V2,V3}]



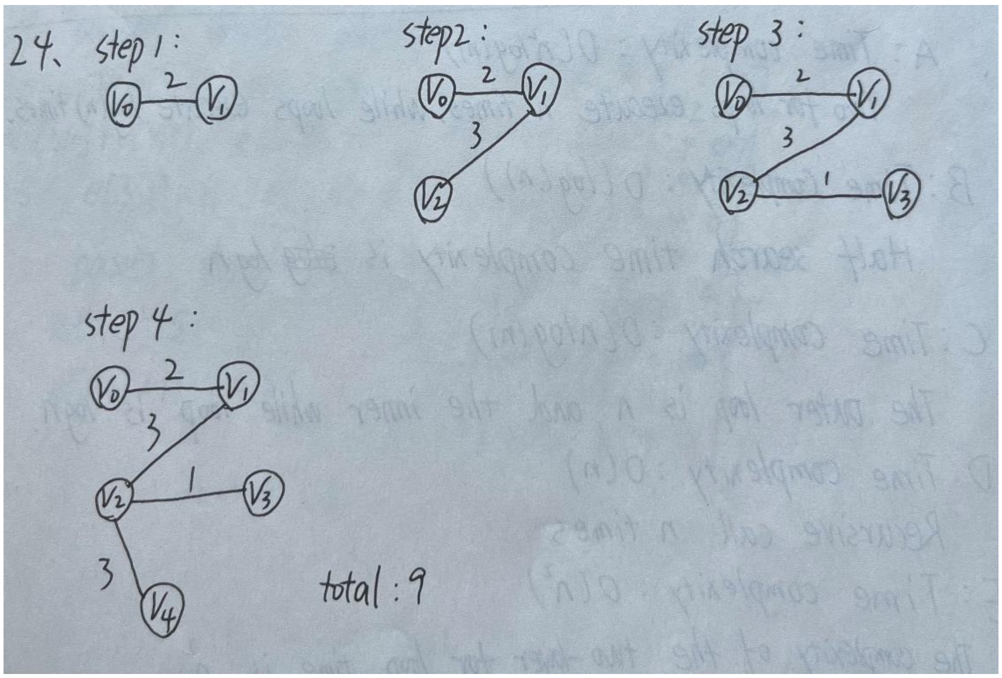
Question 23 Answer:



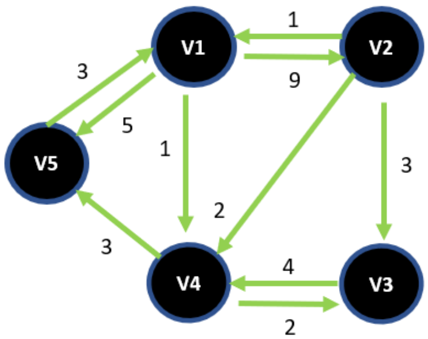
24. show the MSP with the prim algorithm for the bellow graph



Question 24 Answer:



25. with respect to the Floyd algorithm which path between V1 -V3 and V5-V3 have the shortest path



Question 25 Answer:

25. Initial matrix:

$$A = \begin{array}{cc} & \begin{array}{ccccc} 1 & 2 & 3 & 4 & 5 \end{array} \\ \begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{array} & \begin{bmatrix} 0 & 9 & \infty & 1 & 5 \\ 1 & 0 & 3 & 2 & \infty \\ \infty & \infty & 0 & 4 & \infty \\ \infty & \infty & 2 & 0 & 3 \\ 3 & \infty & \infty & \infty & 0 \end{bmatrix} \end{array}$$

when it passes through point 1:

$e[2,5] > e[2,1]+e[1,5]$, $e[2,5]=6$

$e[5,2] > e[5,1]+e[1,2]$, $e[5,2]=12$

$e[5,4] > e[5,1]+e[1,4]$, $e[5,4]=4$

$$A_1 = \begin{array}{cc} & \begin{array}{ccccc} 1 & 2 & 3 & 4 & 5 \end{array} \\ \begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{array} & \begin{bmatrix} 0 & 9 & \infty & 1 & 5 \\ 1 & 0 & 3 & 2 & 6 \\ \infty & \infty & 0 & 4 & \infty \\ \infty & \infty & 2 & 0 & 3 \\ 3 & 12 & \infty & 4 & 0 \end{bmatrix} \end{array}$$

when it passes through point 2:

$e[1,3] > e[1,2]+e[2,3]$, $e[1,3]=12$

$e[5,3] > e[5,2]+e[2,3]$, $e[5,3]=15$

$$A_2 = \begin{array}{cc} & \begin{array}{ccccc} 1 & 2 & 3 & 4 & 5 \end{array} \\ \begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{array} & \begin{bmatrix} 0 & 9 & 12 & 1 & 5 \\ 1 & 0 & 3 & 2 & 6 \\ \infty & \infty & 0 & 4 & \infty \\ \infty & \infty & 2 & 0 & 3 \\ 3 & 12 & 15 & 4 & 0 \end{bmatrix} \end{array}$$

When it passes through point 3:

$$A_3 = \begin{array}{cc} & \begin{array}{ccccc} 1 & 2 & 3 & 4 & 5 \end{array} \\ \begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{array} & \begin{bmatrix} 0 & 9 & 12 & 1 & 5 \\ 1 & 0 & 3 & 2 & 6 \\ \infty & \infty & 0 & 4 & \infty \\ \infty & \infty & 2 & 0 & 3 \\ 3 & 12 & 15 & 4 & 0 \end{bmatrix} \end{array}$$

when it passes through point 4:

$e[1,3] > e[1,4]+e[4,3]$, $e[1,3]=3$

$e[1,5] > e[1,4]+e[4,5]$, $e[1,5]=4$

$e[2,5]=5$ $e[5,3]=6$ $e[3,5]=7$

$$A_4 = \begin{array}{cc} & \begin{array}{ccccc} 1 & 2 & 3 & 4 & 5 \end{array} \\ \begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{array} & \begin{bmatrix} 0 & 9 & 3 & 1 & 4 \\ 1 & 0 & 3 & 2 & 5 \\ \infty & \infty & 0 & 4 & 7 \\ \infty & \infty & 2 & 0 & 3 \\ 3 & 12 & 6 & 4 & 0 \end{bmatrix} \end{array}$$

when it passes through point 5:

$e[4,1]=6$ $e[4,2]=15$

$e[3,1]=10$ $e[3,2]=19$

$$A_5 = \begin{array}{cc} & \begin{array}{ccccc} 1 & 2 & 3 & 4 & 5 \end{array} \\ \begin{array}{c} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{array} & \begin{bmatrix} 0 & 9 & 3 & 1 & 4 \\ 1 & 0 & 3 & 2 & 5 \\ 10 & 19 & 0 & 4 & 7 \\ 6 & 15 & 2 & 0 & 3 \\ 3 & 12 & 6 & 4 & 0 \end{bmatrix} \end{array}$$

$V_1 \to V_3$: 3 $V_5 \to V_3$: 6

26.With respect to the 0/1 knapsack with n=7 objects and the capacity of knapsack m=12. what's the maximum benefits ?

i	1	2	3	4	5
Pi	35 RMB	30 RMB	20 RMB	12 RMB	7 RMB
Wi	6	5	2	3	1

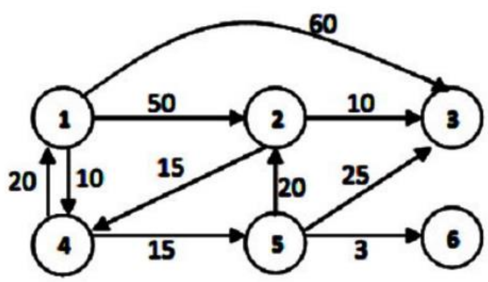
Question 26 Answer:

26、

n \ m	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	7	20	20	20	30	35	35	35	35	35	35	35
2	0	7	20	27	27	32	37	50	55	55	55	65	65
3	0	7	20	27	27	32	39	50	57	62	62	~~69~~ 67	~~[illegible]~~ 67
4	0	7	20	27	27	32	39	50	57	62	62	69	74
5	0	7	20	27	27	32	39	50	57	62	62	69	74
6	0	7	20	27	27	32	39	50	57	62	62	69	74
7	0	7	20	27	27	32	39	50	57	62	62	69	$\boxed{74}$

The final selected item is: 1、3、4、5

27. with DIJKSTRAS algorithm what's the minimum between node 1,2and 3?



Question 27 Answer:

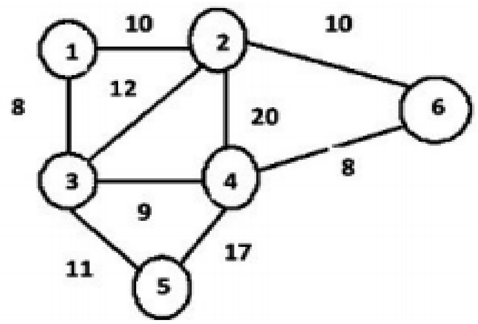
27、

Q: 1	2	3	4	5	6	
$\boxed{0}$	∞	∞	∞	∞	∞	S:{1}
	50	60	$\boxed{10}$	∞	∞	S:{1、4}
	50	60		$\boxed{25}$	∞	S:{1、4、5}
	45	50			$\boxed{28}$	S:{1、4、5、6}
	$\boxed{45}$	50				S:{1、4、5、6、2}
		$\boxed{50}$				S:{1、4、5、6、2、3}.

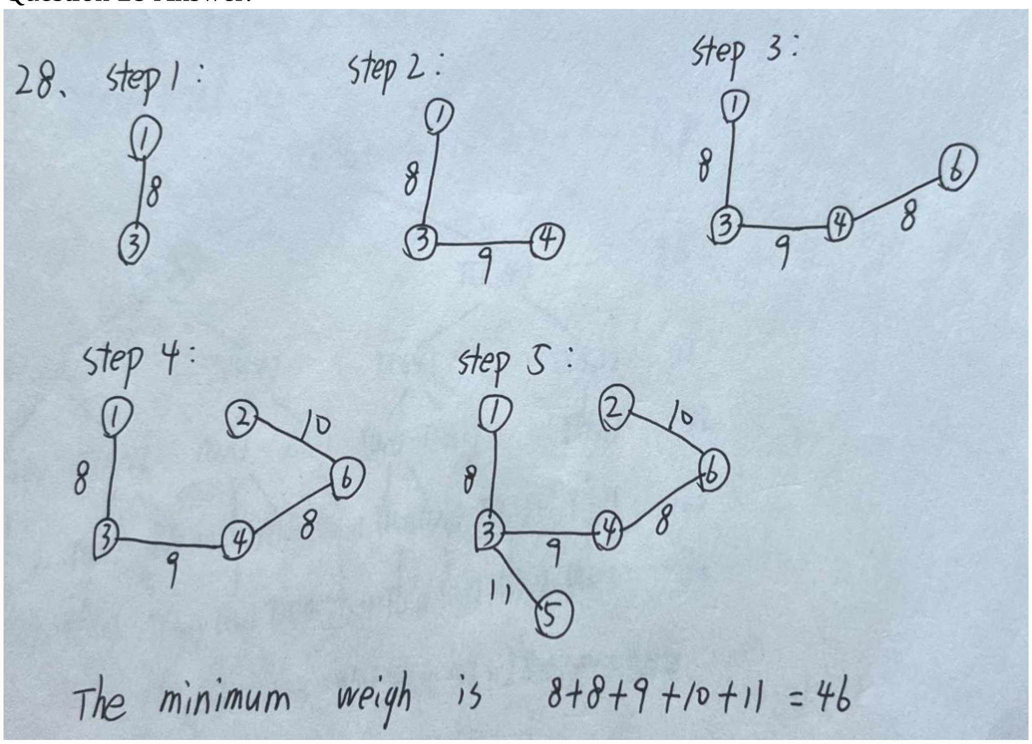
1→2 : 45

1→3 : 50

28. by using the Prime algorithm, whats the minimum weights of optimized tree

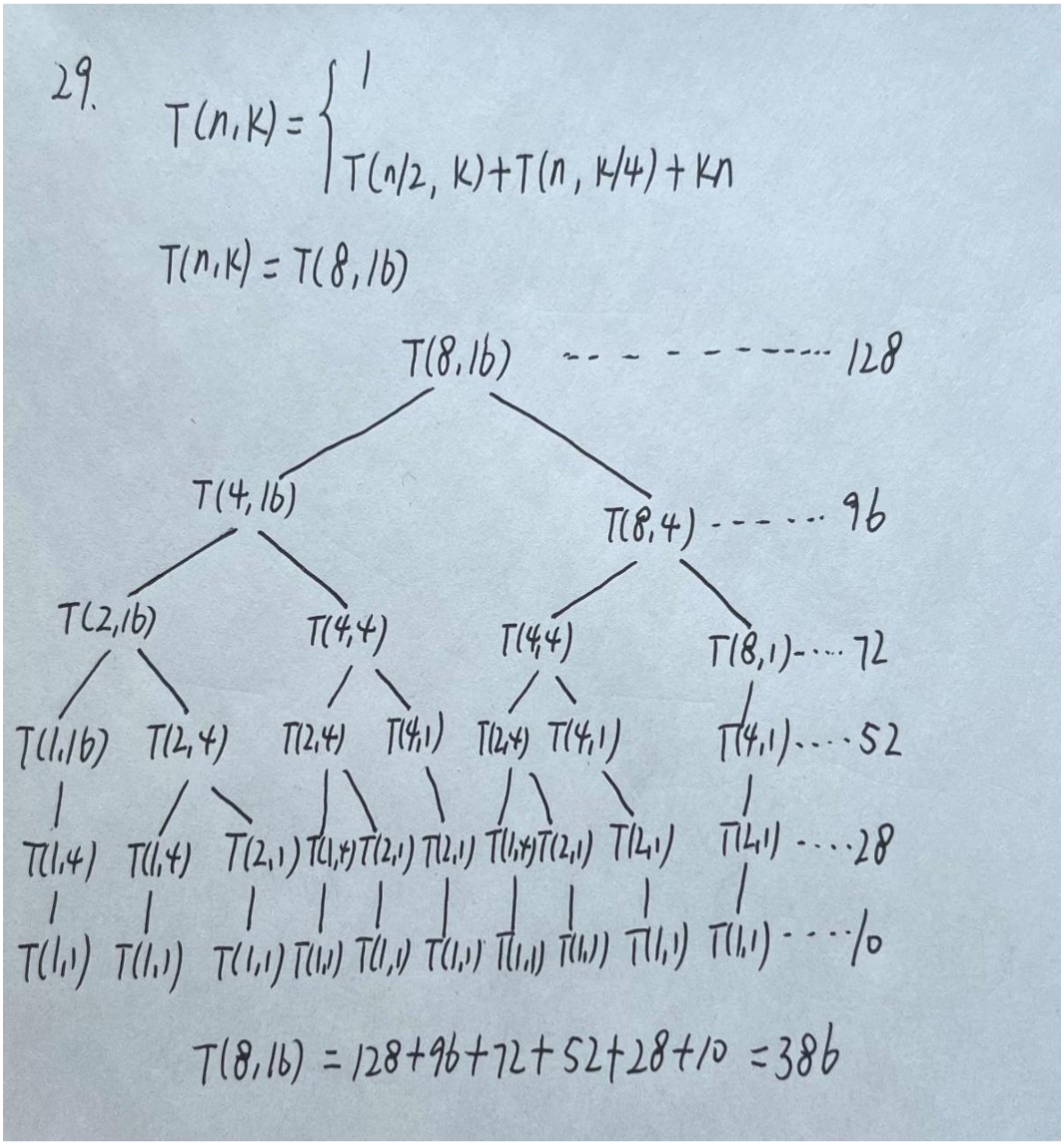


Question 28 Answer:



29. Draw the recursive tree with the branches and leaves of the following recursive function for T (8,16)? And what is the execution order (degree) of the following recursive function? Note: Stop the recursion branches when the value of one of the variables reaches to number 1. (height of the tree) T(n, k)=T(n/2,k)+T(n, k/4)+kn.

Question 29 Answer:



30. An algorithm is written which divides each input of a problem of size n into two approximately equal parts. It solves the sub-problems recursively and then combine the answer by a linear degree of complexity as the following. Find the final degree of complexity? Recursive function: T(n) = 2T(n/2) + O(n)

Question 30 Answer:

30、 $T(n) = 2T(\frac{n}{2}) + O(n)$

Solution : $a=2$, $b=2$, $k=1$, $p=0$

clearly : $a=2$, $b^k = 2 \Rightarrow a = b^k$

case-02 : $p = 0 > -1$

$T(n) = \theta(n^{\log_b a} \log^{p+1} n)$ $T(n) = \theta(n^{\log_2 2} \log^1 n)$

Thus, $T(n) = \theta(n \log n)$