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Question 1:

a) DFS
Order of vertex visit: {1,2,3,4,5,6,8,7}
Discovery edges in order of labeling: (1,2), (2,3), (3,4), (4,5), (5,6), (6,8), (5,7)
Back edges in order of labeling: (3,1), (5,3), (6,3), (8,4), (7,4)

b) BFS
Order of vertex visit: {1,2,3,4,5,6,7,8}
Lists Li: L0{(1), L1{(2), (3)}, L2{(4), (5), (6)}, L3{(7), (8)}
Discovery edges in order of labeling: (1,2), (1,3), (3,4), (3,5), (3,6), (4,7), (4,8)
Cross edges in order of labeling: (2,3), (4,5), (5,6), (5,7), (6,8)

Question 2: Dijkstra

a)

New Vertex	A	B	C	D	E	F	New Edge
A	0	5	∞	10	∞	4	---
F	0	5	∞	9	∞	4	(A,F)
B	0	5	7	8	∞	4	(A,B)
C	0	5	7	8	9	4	(B,C)
D	0	5	7	8	9	4	(B,D)
E	0	5	7	8	9	4	(D,E)

b) weight of shortest path spanning tree = 9+7+8+9 = 33

Question 3:

a) Prim-Jarnik algorithm:
Edges in order they are added to MST (direction important): (A,F), (F,D), (D,E), (E,C), (E,B)
Total weight of the MST=14

b) Kruskal's algorithm
Edges in order they are added to MST: (D,E), (E,C), (C,B), (A,F), (A,B)
Total weight of the MST=14

Question 4:
a) chaining:

0	1	2	3	4	5	6	7	8	9	10
		13	3 -> 25	15 -> 4	5 -> 16					

Number of probes to find each key: 5:1, 3:1, 15:1, 25:2, 4:2 , 13:1 , 16:2
Average number of probes to find a key: (10/7) = 1.43
b) quadratic probing:

0	1	2	3	4	5	6	7	8	9	10
		13	3	15	5	16	25	4		

Number of probes to find each key: 5:1, 3:1, 15:1, 25:3, 4:3, 13:1, 16:2
Average number of probes to find a key: (12/7) = 1.71

c) double hashing:

0	1	2	3	4	5	6	7	8	9	10
16		13	3	15	5			28	4	

Number of probes to find each key: 5:1, 3:1, 15:1, 25:2, 4:2, 13:1, 16:5
Average number of probes to find a key: (13/7) = 1.86

a) Mergesort tree: (feel free to continue tree in text mode)

45 27 20 25 | 26 12 40 28 → 12 20 25 26 27 28 40 45

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                 /                                                        \
45 27 | 20 25->20 25 27 45                               26 12 | 40 28->12 26 28 40
         /              \                                          /              \
45|27->27 45     20|25->20 25                          26|12->12 26        40|28->28 40
  /          \            /          \                              /        \               /         \
45->45     27->27      20->20   25->25               26->26     12->12      40->40    28->28
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b) Quicksort table: (feel free to add more rows)

a	b	S
-	-	[45, 27, 20, 25, 26, 12, 40, 28]
0	7	[12, 27, 20, 25, 26, 28, 40, 45]
0	4	[12, 25, 20, 26, 27, 28, 40, 45]
0	2	[12, 20, 25, 26, 27, 28, 40, 45]
6	7	[12, 20, 25, 26, 27, 28, 40, 45]
		[12, 20, 25, 26, 27, 28, 40, 45]