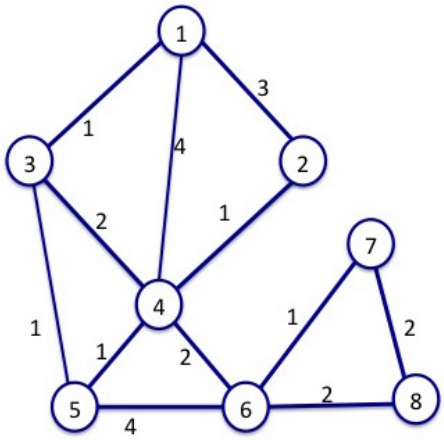
Review Questions for Final Exam These review questions are only from topics after midterm. Questions similar to those given in the quizzes might also come in the final. 70% of the final will be from the topics after midterm (Dynamic Programming and beyond) and 30% from the topics before the midterm.

1. Give an example (by drawing or by describing) of the following *undirected* graphs
   (a) A graph where the degree in each vertex is even and the total number of edges is odd
   (b) A graph that does not have an eulerian cycle. An eulerian cycle is a cycle where every edge of the graph is visited exactly once.
   (c) A graph that does not have any cycles and the maximum degree of a node is 2 (minimum degree can be zero)
   (d) A graph where there exists a breadth first search and depth first search that will yield the same order of vertices
   (e) A graph where at least half of its vertices have to be removed to make it disconnected
2. For the graph given in the Figure do the following. Show all your steps



   (a) Find two different minimum spanning trees.
   (b) Find the distance from vertex 4 to all other vertices
3. For the graph given in the Figure 1,find the maximum flow from vertex s to vertex t.
4. Explain the difference between undecidable, NP-complete and NP-hard problems ?
5. A thief enters a store and sees the following items; (i)Choclate Powder, 2pounds, total cost $100, (ii) Coffee Powder, 4 pounds $150 and (iii) Sugar, 8 pounds, $200. His bag can hold upto 4 pounds of items. How can he maximize his loot ?

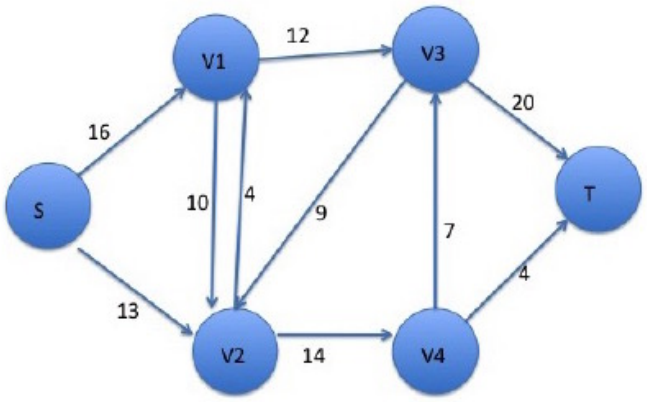


Figure 1: default

6. Given below is a list of activities with the start and end times; S1=1,2; S2=4,5, S3=1,5, S4=4,6, S5=7,9, S6=4,9
   What is the maximum number of activities possible from timepoints 1 to 9, assuming activities cannot be overlapped/

7. Create the huffman code for the given set of letters with the following frequencies (normalized to percentages):

   A:5, B:6, C:10, D:14 E:15,F:20, G:30

8. Given a positive integer n, develop a reclusive relation to compute the number of ways you can express n as a sum of the integers (1,3,4). You can reuse the numbers in the sum. (HINT: use dynamic programming or backtracking).

9. Given below are the returns of investments for the mounts given in the first column. For example investing \$200 in Inv2 gives back \$9. Give the recursion formula (5)
   Show with steps the best possible return for investing \$400 (5)

	100	200	300	400
$Inv1$	5	11	23	47
$Inv2$	4	9	25	40
$Inv3$	2	9	20	41
$Inv4$	3	7	22	42

10. Given below are the distances between A, B, C, D, E, F. You have to start from A, visit all the vertices and return back to the A. Find the optimal path using the approximate algorithm discussed in class

	A	B	C	D	E	F
A	0	4	5	5	5	6
B	4	0	5	4	3	3
C	5	5	0	5	6	4
D	5	4	5	0	4	5
E	5	3	6	4	0	5
F	6	3	4	5	5	0

11. Compute the approximate vertex cover for the given graph using the approximation algorithm discussed in class. Show all your steps. (4)
Also find the minimum vertex cover by inspection. (4)
Give the example of a graph whether the approximation method will also give the minimum vertex cover (2)

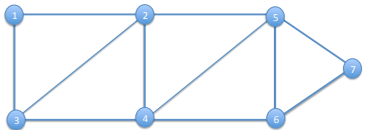


Figure 2: Graph