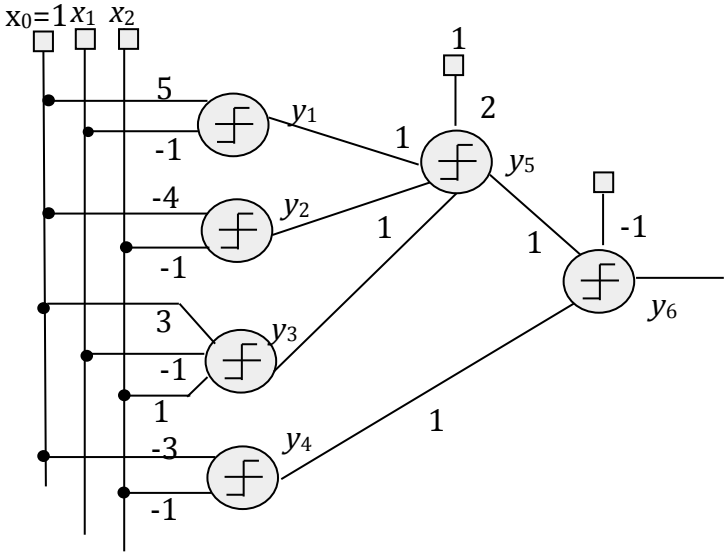
Q1) Let f(a) be the perceptron output function:
f(a)=1 if a>=0, f(a) =-1 otherwise
Here $a_i=\mathbf{x}_i.\mathbf{w}_i$ for i=1..7
Notice that the weight of the connection to line x_0 is corresponding to -θ



write here line equations for

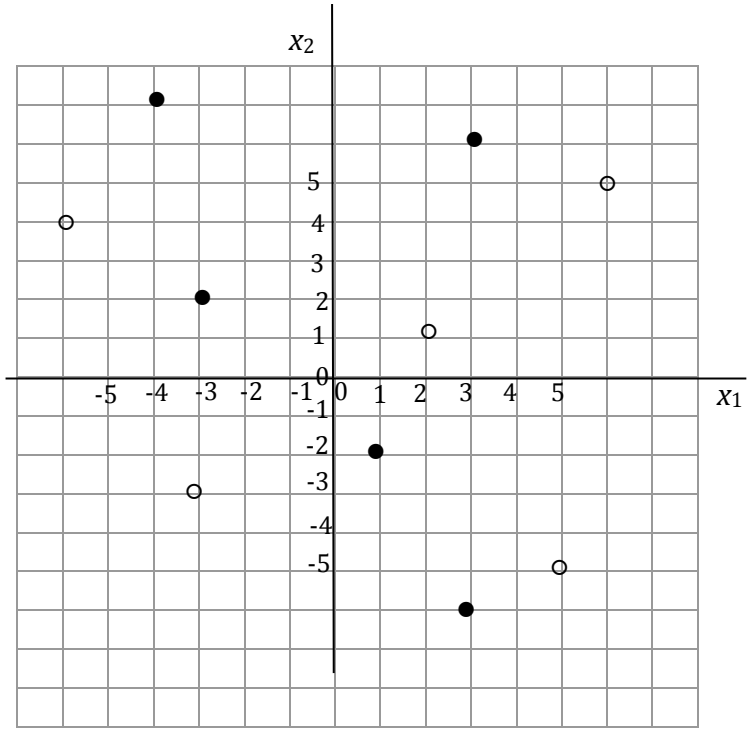
y1:

y2

y3:

y4

a) Considering the multilayer perceptron network given above, write the line equation corresponding to y_1, y_2, y_3 and y_4, and draw them.
b) Find the regions for which y_6 is +1 (shade the regions)
c) Mark the samples which are classified correctly (actual clases: ●=+1, ○=-1).



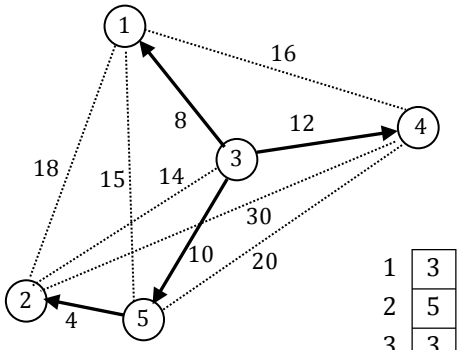
Q2) Given n stations are to be linked using a communication network. The laying of communication lines between any two stations involves a cost.

The problem is to obtain a network of communication links which

- preserves the connectivity between stations
- and has minimum cost.

The problem has no polynomial time solution, that is the time required to find the solution grows exponentially as n increases.

An evolutionary algorithm, having n genes in a chromosome is to be used for the approximate solution of the problem. The value j of a gene(i) represents that a line is layed from j to i.



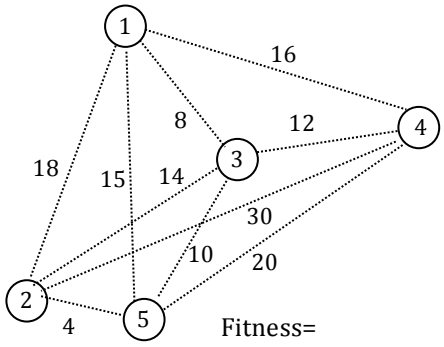
1	3
2	5
3	3
4	3
5	3

An intance of the problem is represented by a graph in the figure. In the graph, the stations are shown by circles, n=5. The weight shown on a link between two station is the cost of laying communication lines connecting these stations. If gene(i)=i, then this means, station i is connected to itself, but the cost is 0. The direction has no effect on the cost, howevever, if gene(i)=j and gene(j)=i, this means that the link is layed two times, therefore increasing the total cost unneccessarily.

The solution represented by the chromosome given in the figure is shown by solid lines in the figure. For this solution, the cost is: Cost=4+8+10+12=34. In fact this is the minimum cost.

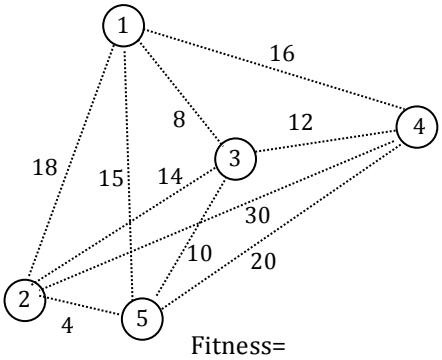
For the chromosomes given below, show the corresponding solutions on the graphs next to them. Set Fitness=C and calculate it.

1	
2	
3	
4	
5	



Fitness=

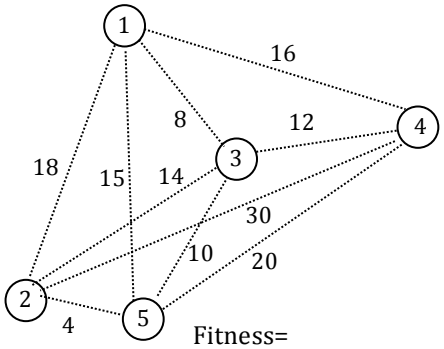
1	
2	
3	
4	
5	



Fitness=

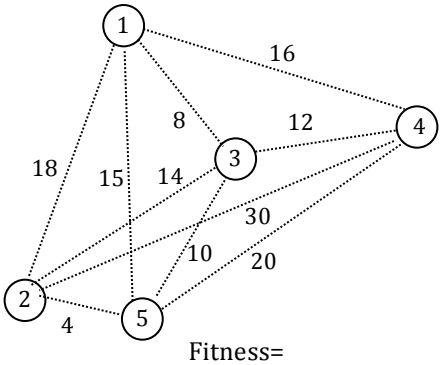
For the parental chromosomes given above, apply a cross over,at the cut point between genes 2 and 3, and write below the corresponding offsprings.

1	
2	
3	
4	
5	



Fitness=

1	
2	
3	
4	
5	



Fitness=

Q3) Consider two fuzzy subsets of the set X, X = {a, b, c, d, e } referred to as A and B
A = {1/a, 0.3/b, 0.2/c 0.8/d, 0/e} and B = {0.6/a, 0.9/b, 0.1/c, 0.3/d, 0.2/e}

Find

a) Support
A:
B:
b) core
A:
B:
c) complement:
A':
B'
d) union:
A∪ B:
e) intersection
A∩B: