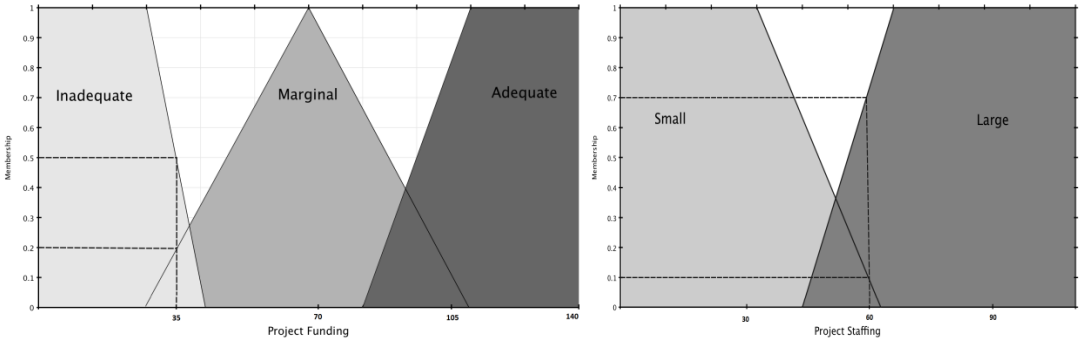
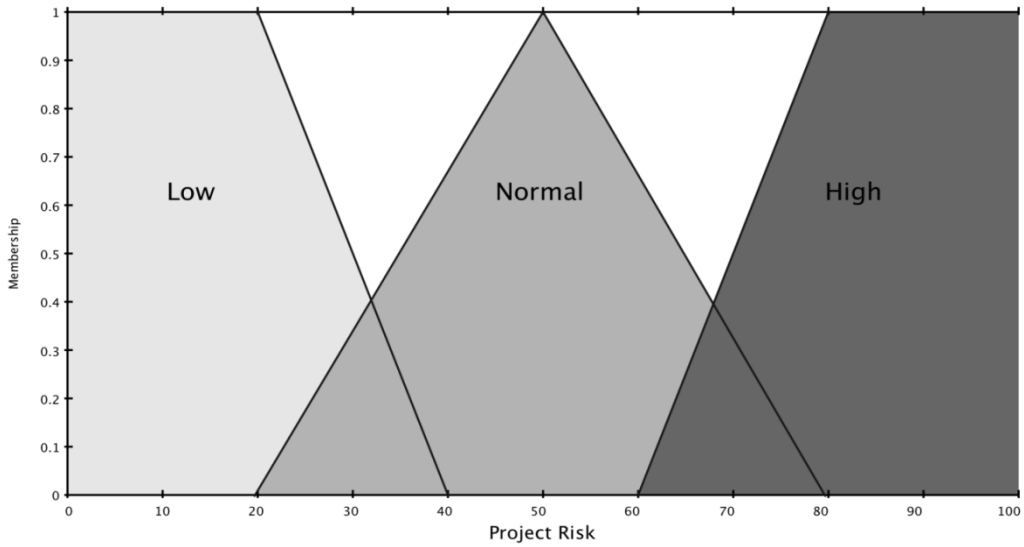
Fuzzy Logic (18 mins, 18 pts)

The problem is to estimate the level of risk involved in a software engineering project. For the sake of simplicity we will arrive at our conclusion based on two inputs: project funding and project staffing.





The rules are as follows:

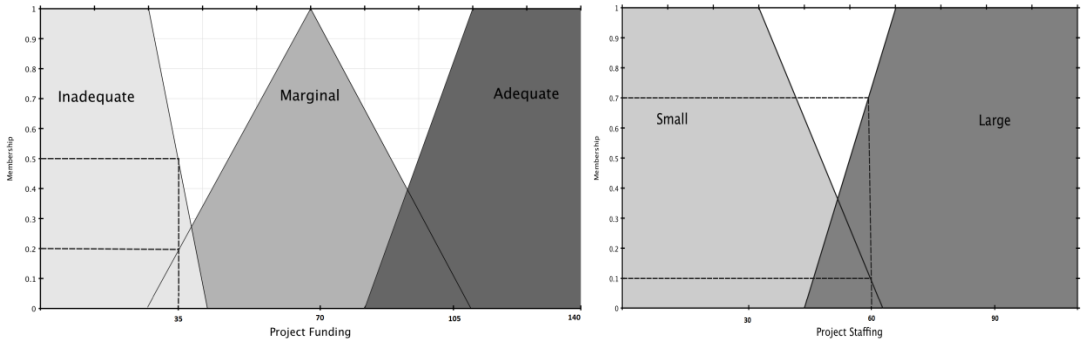
1. If **project_funding** is adequate or **project_staffing** is small then risk is low.
2. If **project_funding** is marginal and **project_staffing** is large then risk is normal.
3. If **project_funding** is inadequate then **risk** is high.

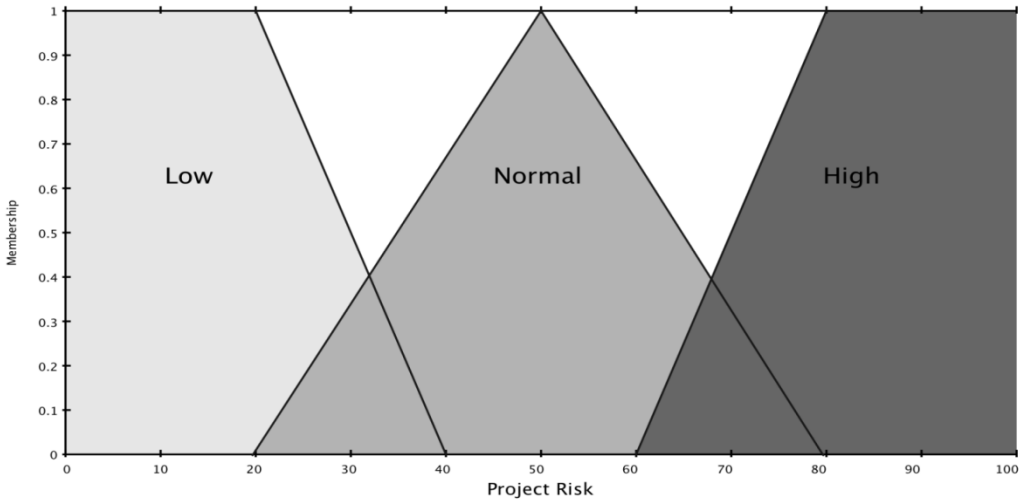
Suppose our inputs are **project_funding** = 35% and **project_staffing** = 60%. We can get the fuzzy values for these crisp values by using the membership functions of the appropriate sets. The sets defined for **project_funding** are inadequate, marginal and adequate. The sets defined for **project_staffing** are small and large.

Questions:

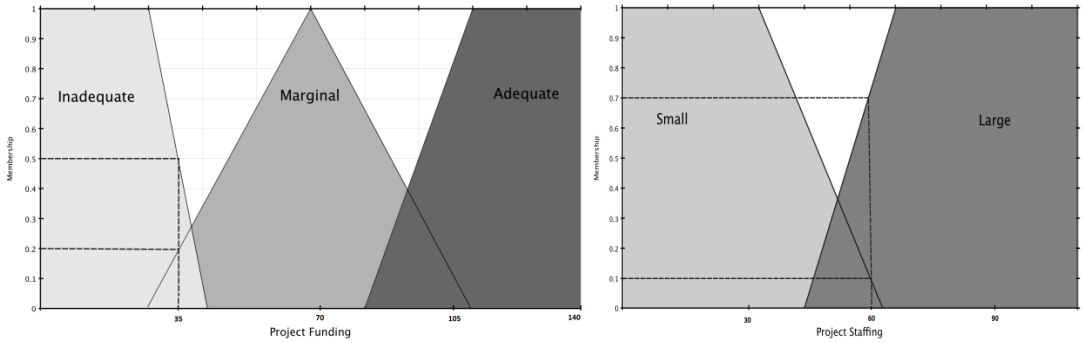
(1) Perform fuzzification of the input variables. (3 pts)

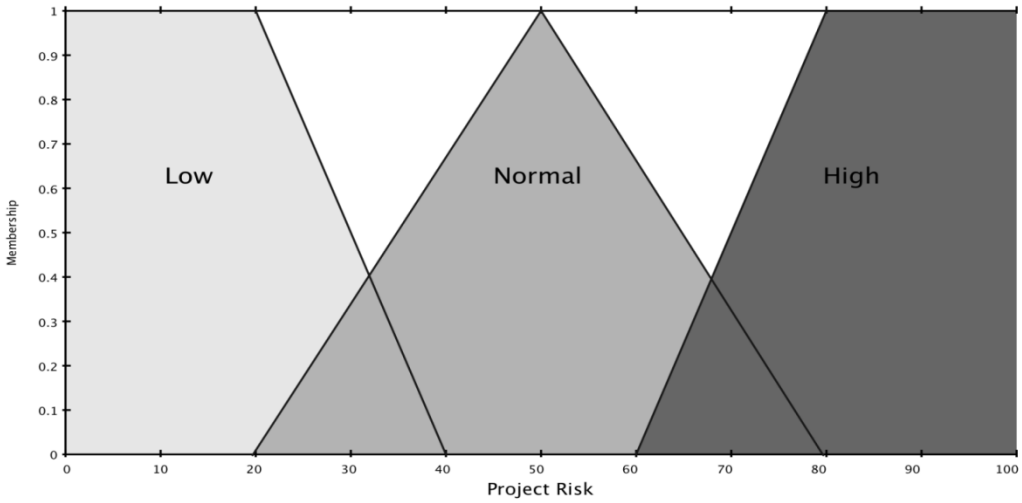
(2) Estimate $\mu_{\text{risk=low}}(z)$ and show it on an image/images below. (3 pts)



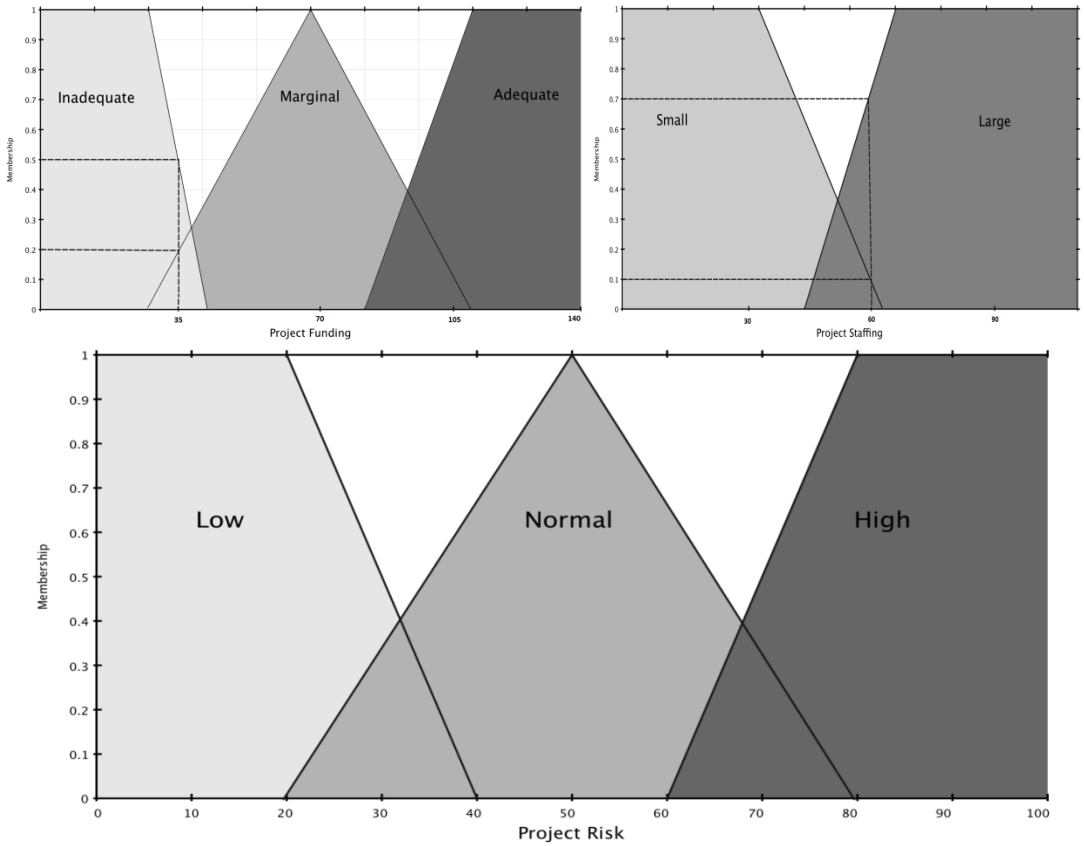


(3) Estimate $\mu_{\text{risk=normal}}(z)$ and show it on an image/images below. (3 pts)

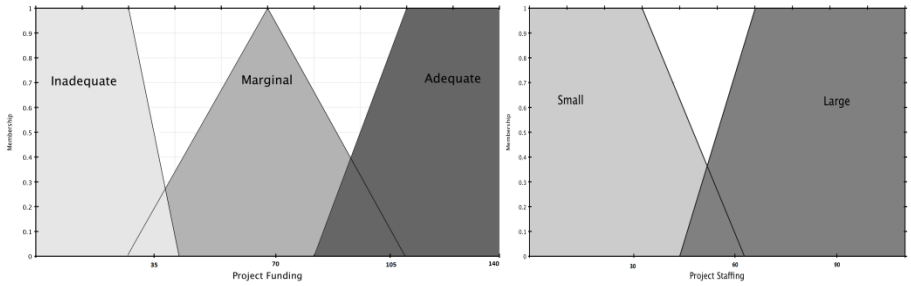


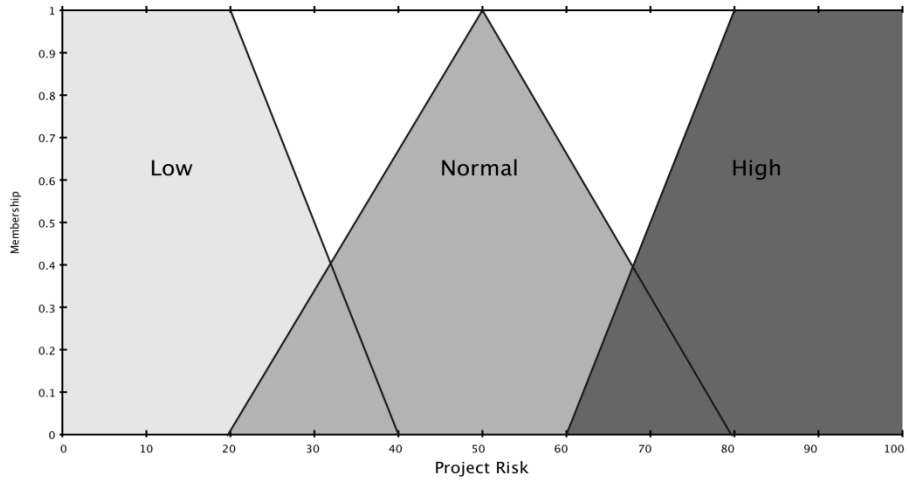


(4) Estimate $\mu_{\text{risk=high}}(z)$ and show it on an image/images below. (3 pts)



(5) Perform Aggregation of rule outputs and show it on an image/images below. (3 pts)





(6) Explain how you would perform Defuzzification. (3 pts)

(7) **Extra Credit 1:** Give the value of project risk. (5mins, 5 pts)