

Self test Questions for Slides Set #7

Prof. K R Chowdhary

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[These questions should help review the key concepts presented in the slides!]

1. Define regression in the context of supervised learning.
2. What does the regression model $\mathbf{y} = f(\mathbf{x}) + \varepsilon$ represent in terms of input and output?
3. Explain the role of the random error term ε in the regression model.
4. What are the two main tasks of supervised learning?
5. Explain the difference between regression and classification.
6. Explain the goal of regression in supervised learning.
7. How do you use Ordinary Least Squares (OLS) regression to learn a model?
8. In the linear regression equation $\hat{y} = \beta_0 + \beta_1 \cdot x$, what do β_0 and β_1 represent?
9. What is the process of minimizing the error in regression models?
10. Define the "cost function" in regression and describe its purpose.
11. Why do we square the differences between the predicted and actual values in the cost function?
12. What are the consequences of using squared differences as opposed to absolute differences?
13. How does the sum of squared errors (cost function) help in finding the best-fitting line?
14. Describe the data presented in the example in slide set 7.
15. What do the vectors \mathbf{x} and \mathbf{y} represent in this case?
16. How is the linear regression model applied to this data?
17. What does the graph in Fig-1 represent, and how does the regression line in Fig-2 fit the data?
18. How do you calculate the slope (β_1) and the intercept (β_0) of the regression line using the OLS formula?
19. Write down and explain the formulas used to compute these parameters.
20. Explain why the OLS method works well for small datasets or when the number of features is low.

21. What challenges arise when applying OLS to larger datasets or higher-dimensional problems?
22. List and explain at least three real-world applications of regression in various fields.
23. How is regression applied in business for forecasting sales or stock market prediction?
24. How can regression help in healthcare for disease prediction?
25. What is the role of regression in economics and business decision-making?
26. Explain how regression can be used for demand forecasting and cost-profit analysis.
27. Describe how regression can be applied in agriculture.
28. How can regression help predict crop yields and optimize farming practices?
29. In the context of environmental studies, explain how regression can be used for climate change modeling or pollution impact analysis.