General Linear Model:

1. What is the purpose of the General Linear Model (GLM)?
2. What are the key assumptions of the General Linear Model?
3. How do you interpret the coefficients in a GLM?
4. What is the difference between a univariate and multivariate GLM?
5. Explain the concept of interaction effects in a GLM.
6. How do you handle categorical predictors in a GLM?
7. What is the purpose of the design matrix in a GLM?
8. How do you test the significance of predictors in a GLM?
9. What is the difference between Type I, Type II, and Type III sums of squares in a GLM?
10. Explain the concept of deviance in a GLM.

Regression:

11. What is regression analysis and what is its purpose?
12. What is the difference between simple linear regression and multiple linear regression?
13. How do you interpret the R-squared value in regression?
14. What is the difference between correlation and regression?
15. What is the difference between the coefficients and the intercept in regression?
16. How do you handle outliers in regression analysis?
17. What is the difference between ridge regression and ordinary least squares regression?
18. What is heteroscedasticity in regression and how does it affect the model?
19. How do you handle multicollinearity in regression analysis?
20. What is polynomial regression and when is it used?

Loss function:

21. What is a loss function and what is its purpose in machine learning?
22. What is the difference between a convex and non-convex loss function?
23. What is mean squared error (MSE) and how is it calculated?
24. What is mean absolute error (MAE) and how is it calculated?
25. What is log loss (cross-entropy loss) and how is it calculated?
26. How do you choose the appropriate loss function for a given problem?
27. Explain the concept of regularization in the context of loss functions.
28. What is Huber loss and how does it handle outliers?
29. What is quantile loss and when is it used?
30. What is the difference between squared loss and absolute loss?

Optimizer (GD):

31. What is an optimizer and what is its purpose in machine learning?

32. What is Gradient Descent (GD) and how does it work?
33. What are the different variations of Gradient Descent?
34. What is the learning rate in GD and how do you choose an appropriate value?
35. How does GD handle local optima in optimization problems?
36. What is Stochastic Gradient Descent (SGD) and how does it differ from GD?
37. Explain the concept of batch size in GD and its impact on training.
38. What is the role of momentum in optimization algorithms?
39. What is the difference between batch GD, mini-batch GD, and SGD?
40. How does the learning rate affect the convergence of GD?

Regularization:

41. What is regularization and why is it used in machine learning?
42. What is the difference between L1 and L2 regularization?
43. Explain the concept of ridge regression and its role in regularization.
44. What is the elastic net regularization and how does it combine L1 and L2 penalties?
45. How does regularization help prevent overfitting in machine learning models?
46. What is early stopping and how does it relate to regularization?
47. Explain the concept of dropout regularization in neural networks.
48. How do you choose the regularization parameter in a model?
49. What

is the difference between feature selection and regularization?
50. What is the trade-off between bias and variance in regularized models?

SVM:

51. What is Support Vector Machines (SVM) and how does it work?
52. How does the kernel trick work in SVM?
53. What are support vectors in SVM and why are they important?
54. Explain the concept of the margin in SVM and its impact on model performance.
55. How do you handle unbalanced datasets in SVM?
56. What is the difference between linear SVM and non-linear SVM?
57. What is the role of C-parameter in SVM and how does it affect the decision boundary?
58. Explain the concept of slack variables in SVM.
59. What is the difference between hard margin and soft margin in SVM?
60. How do you interpret the coefficients in an SVM model?

Decision Trees:

61. What is a decision tree and how does it work?
62. How do you make splits in a decision tree?
63. What are impurity measures (e.g., Gini index, entropy) and how are they used in decision trees?

64. Explain the concept of information gain in decision trees.
65. How do you handle missing values in decision trees?
66. What is pruning in decision trees and why is it important?
67. What is the difference between a classification tree and a regression tree?
68. How do you interpret the decision boundaries in a decision tree?
69. What is the role of feature importance in decision trees?
70. What are ensemble techniques and how are they related to decision trees?

Ensemble Techniques:

71. What are ensemble techniques in machine learning?
72. What is bagging and how is it used in ensemble learning?
73. Explain the concept of bootstrapping in bagging.
74. What is boosting and how does it work?
75. What is the difference between AdaBoost and Gradient Boosting?
76. What is the purpose of random forests in ensemble learning?
77. How do random forests handle feature importance?
78. What is stacking in ensemble learning and how does it work?
79. What are the advantages and disadvantages of ensemble techniques?
80. How do you choose the optimal number of models in an ensemble?