Question 1
What is the optimal value of alpha for ridge and lasso regression? What will be the changes in the model if you choose double the value of alpha for both ridge and lasso? What will be the most important predictor variables after the change is implemented?

Answer: Optimal value of alpha in Ridge 100 and in Lasso 500.
If we double the alpha value model coefficients coming towards 0 and model will go underfitting.
After doubling the value of alpha of Ridge from 100 to 200
R2 Score (Train) changed from 0.9492025 to 0.9442210
R2 Score (Test) changed from 0.914260 to 0.913196
R2 values are slightly reduced.

After doubling the value of alpha of Lasso from 500 to 1000
R2 Score (Train) changed from 0.942186 to 0.930436
R2 Score (Test) changed from 0.91896 to 0.909191
R2 values are slightly reduced.

Most important predictors variables after the change in Ridge regression are same as before GrLivArea, 1stFlrSF, OverallQual_9, TotalBsmtSF, BsmtFinSF1

In Lasso Regression 1stFlrSF value increased from 0 to 594 remaining values are reduced quietly .

Question 2
You have determined the optimal value of lambda for ridge and lasso regression during the assignment. Now, which one will you choose to apply and why?
Answer: Both the ridge and lasso regression gives us the same R2 Score value but in Lasso regression it gives us better R2 Score for test dataset also in this model it makes most of the predictor variables as zero, it makes model simpler and efficient

Question 3
After building the model, you realised that the five most important predictor variables in the lasso model are not available in the incoming data. You will now have to create another model excluding the five most important predictor variables. Which are the five most important predictor variables now?
Answer: Before removing important predictor variable are
GrLivArea, OverallQual_9, YearBuilt, OverallQual_8, BsmtFinSF1

After removing those above variable, below are the important predictors for modal
2ndFlrSF,1stFlrSF,TotalBsmtSF,Neighborhood_NridgHt,GarageCars_3

Question 4
How can you make sure that a model is robust and generalisable? What are the implications of the same for the accuracy of the model and why?

	Metric	Linear Regression	Ridge Regression	Lasso Regression
0	R2 Score (Train)	9.559159e-01	9.492025e-01	9.421864e-01
1	R2 Score (Test)	-5.399320e+19	9.142609e-01	9.189613e-01
2	RSS (Train)	1.593132e+11	1.835742e+11	2.089293e+11
3	RSS (Test)	9.198341e+31	1.460662e+11	1.380584e+11
4	MSE (Train)	1.407660e+04	1.511047e+04	1.612025e+04
5	MSE (Test)	5.163512e+14	2.057620e+04	2.000423e+04

Overall, based on the derived metrics from the implemented models, both Ridge and Lasso regression models appear to be more robust and generalizable compared to the linear regression model. The linear regression model seems to suffer from overfitting, as evidenced by its excellent performance on the training data but poor performance on the test data. Ridge and Lasso, by introducing regularization, are better at preventing overfitting and achieving better generalization to new, unseen data.