1. Suppose one has a stereo system consisting of two main parts, a radio and a speaker. If the lifetime of the radio is exponential distribution with mean 1000 hours and the lifetime of the speaker is exponential distribution with mean 500 hours independent of the radio's lifetime, then what is the probability that the systems failure (when it occurs) will be caused by the radio failing? . (15%)

2. The service times for customers coming through a checkout counter in a retail store are independent random variables with a mean of 1.5 minutes and a variance of 1.0. Find the probability that 100 customer can be serviced in less than 3 hours of total service time. (15%)

3. If n observations are to be used estimate $(\mu 1 - \mu 2)$, based upon independent random samples, find sample size n1 and n2 so that $Var(\overline{X_1} - \overline{X_2})$ is minimized (assume that n1+n2=n). (15%)

4. Consider the following data for fitting a simple linear regression model, $Y = \beta_0 + \beta_1 X + \varepsilon$.

Y	15	20	14	16	25	20	20	23	14	22	18	18
X	9	19	11	14	23	12	12	22	7	13	15	17

$\sum_{i=1}^{12} X_i = 174$ $\sum_{i=1}^{12} Y_i = 225$ $\sum_{i=1}^{12} X_i Y_i = 3414$ $\sum_{i=1}^{12} X_i^2 = 2792$ $\sum_{i=1}^{12} Y_i^2 = 4359$

(a) Compute the $\hat{\beta}_0$, $\hat{\beta}_1$, MSE, R^2. (20%)

(b) Given Y=21, i.e., making inverse prediction, construct the 95% prediction interval for X. (15%)

5. Consider the following two groups data

A	6.1	7.1	7.8	6.9	7.6	8.2
B	9.1	8.2	8.6	6.9	7.5	7.9

(a) Building a linear regression model to analyze data, specified the corresponding independent variables and dependent variable respectively. (5%)

(b) Conduct the test from the estimated results of linear regression model to see if $\mu 1, \mu 2$ is differ at $\alpha = 0.05$ (15%)

Note:　$t_{0.025,10} = 2.23$ $t_{0.05,10} = 1.81$, Pr(0≦Z≦3)=0.4987, Pr(0≦Z≦2)=0.4772