**Quiz #3(open book, open note) Name: JERRY JACOB**

**Business Analytics, Fall 2016 ID: 01238085**

1. (6 points) The Accounts Payable Department of your firm has AP analysts who process invoices for payment. The total time taken to process an invoice consists of two components: actual “touch time” in which an analyst is actually working on the invoice and queue time in which the invoice is waiting to be processed. That is, total time = touch time + waiting time. Management is concerned that over the past quarter the company has not qualified for a single “prompt payment” discount offered by the company’s vendors. Accordingly, a study has been instituted to find out what is going on.
   1. A sample of 200 invoices has been taken with the touch time required for each invoice recorded in the accompanying data set. Based on this sample, what is your best estimate for the mean and standard deviation of the *time taken to process an invoice*?

Time taken to process invoice = touch time + waiting time

Sample Mean =AVERAGE(time taken to process invoice)

= 12208.37 Mins.

Sample Standard Deviation = STDEV(time taken to process invoice)

= 3286.842 Mins.

* 1. What is the estimate of the mean and standard deviation of the sampling distribution (sample size = 200).

Using the above estimates for the time taken to process an invoice,

Mean of sampling distribution = 12208.37 Mins.

Std. Deviation of sampling distribution = Sample Std. Error

= 3286.842/SQRT(200)

= 232.41483 Mins.

* 1. Derive a 95% confidence interval for the average touch time take to process an invoice. Hint: set Lower and Upper fenceposts as in the week 5 lecture.

Mean (touch time) = AVERAGE(touch time)

= Mean of sampling dist. (touch time)

= 25.63 Mins.

StdDev(touch time)= STDEV(touch time)

= 8.126 Mins.

Std. dev of sampling dist. = Sample Std. Error (200 touch time)

= 8.126/SQRT(200)

= 0.5746

NORMSINV(0.975) = 1.959964

Lower post for 95% confidence = Mean - 1.959964 \* 0.5746

= 25.63 - 1.1262

= 24.5038 Mins

Upper post for 95% confidence = Mean + 1.959964 \* 0.5746

= 25.63 + 1.1262

= 26.7562 Mins

1. (4 points) Use the same dataset as for problem 1.
   1. What is the mean and standard deviation of the waiting time (queue time) for invoices?

Sample Mean =AVERAGE(wait time)

= 12182.74 Mins.

Sample Standard Deviation = STDEV(wait time)

= 3286.789 Mins.

* 1. Assume that the touch time and waiting time are independent random variables, Also assume that both the touch time and the waiting time are normally distributed. What is the probability that the total time taken to process an invoice (as defined in problem 1) is less than 10,000 minutes.

Mean = Mean(touch time) + Mean (waiting time)

= 1\*25.63 Mins. + 1\*12182.74 Mins.

= 12208.37 Mins.

Variance = Variance(touch time) + Variance (waiting time)

= (8.126)^2 + (3286.789)^2

= 10803047.96

Sample Standard Deviation = SQRT(10803047.96)

= 3286.799 Mins.

P(N<=10,000) = NORMDIST(10000,12208,3287,1)

= 0.250875524 = 25.09%