Name: _____

FO-3015 Final Exam-04

1. The following tally is from a BAF 7.5 prism cruise on 40 acres where sample tree data resulted in the local volume equation:

Board feet = 10.0 + 6.0(DBH)

		Tally								
Point#	DBH	Trees								
1	12	3								
	10	2								
	14	4								
2	10	3								
	12	2								
	14	3								
3	14	3								
	12	2								
	10	4								
4	10	3								
	14	2								
	12	3								
5	10	2								
	14	3								
	12	2								

A. The Stand and Stock table for the prism cruise (with basal area by dbh class) is: (48)

B. The best estimate of mean volume per acre is: _____ (12)

C. The Sampling Error at the 95% confidence level is: _____ (10)

D. The Coefficient of Variation is: _____ (10)

2. DOUBLE POINT SAMPLE: Suppose the point sample in Question 1 above was the 5 volume points from a BAF 7.5 **double** sample with a 5:1 ratio of basal area to volume points.

Additional data from double sample cruise:

Count points	= 25
Volume points	= 5
Total Points	= 30

Tree Tally:	= 235 trees on 25 Count points
	= 41 trees on 5 Volume points
Total trees	= 276 trees on 30 Total BAF 7.5 points

From regression of volume per acre as a function of basal area per acre:

Volume =327.81 +65.7(BA)

a. Compute the large sample (i.e. overall) basal area per acre: (10)

b. Compute the adjusted Doyle volume per acre with the linear regression adjustment formula: (10)

Student's t-Table

Forest Description and Analysis

The Distribution of Probability

df	0.5	0.4	0.3	0.2	0.1	0.05	0.02	0.01	0.001
1	1.000	1.376	1.963	3.078	6.314	12.706	31.821	63.657	636.619
2	0.819	1.061	1.386	1.886	2.920	4.303	6.965	9.925	31.598
3	0.765	0.978	1.250	1.638	2.353	3.182	4.541	5.841	12.941
4	0.741	0.941	1.190	1.533	2.132	2.776	3.747	4.604	8.610
5	0.727	0.920	1.156	1.476	2.015	2.571	3.365	4.032	6.856
6	0.718	0.906	1.134	1.440	1.943	2.447	3.143	3.707	5.959
7	0.711	0.896	1.119	1.415	1.895	2.365	2.998	3.499	5.405
8	0.706	0.889	1.108	1.397	1.860	2.306	2.896	3.355	5.041
9	0.703	0.883	1.100	1.383	1.833	2.262	2.821	3.250	4.781
10	0.700	0.879	1.093	1.372	1.812	2.228	2.764	3.169	4.587
11	0.697	0.876	1.088	1.363	1.769	2.201	2.718	3.106	4.437
12	0.695	0.873	1.083	1.356	1.782	2.179	2.681	3.055	4.318
13	0.694	0.870	1.079	1.350	1.771	2.160	2.650	3.012	4.221
14	0.692	0.868	1.076	1.345	1.761	2.145	2.624	2.977	4.140
15	0.691	0.866	1.074	1.341	1.753	2.131	2.602	2.947	4.073
16	0.690	0.865	1.071	1.337	1.746	2.120	2.583	2.921	4.015
17	0.689	0.863	1.069	1.333	1.740	2.110	2.567	2.898	3.965
18	0.688	0.862	1.067	1.330	1.734	2.101	2.552	2.878	3.922
19	0.688	0.861	1.066	1.328	1.729	2.093	2.539	2.861	3.883
20	0.687	0.860	1.064	1.325	1.725	2.086	2.528	2.845	3.850
21	0.686	0.859	1.063	1.323	1.721	2.080	2.518	2.831	3.819
22	0.686	0.858	1.061	1.321	1.717	2.074	2.508	2.819	3.792
23	0.685	0.858	1.060	1.319	1.714	2.069	2.500	2.807	3.767
24	0.685	0.857	1.059	1.318	1.711	2.064	2.492	2.797	3.745
25	0.684	0.856	1.058	1.316	1.708	2.060	2.485	2.787	3.725
26	0.684	0.856	1.058	1.315	1.706	2.056	2.479	2.779	3.707
27	0.684	0.855	1.057	1.314	1.703	2.052	2.473	2.771	3.690
28	0.683	0.855	1.056	1.313	1.701	2.048	2.467	2.763	3.674
29	0.683	0.854	1.055	1.311	1.699	2.045	2.462	2.756	3.659
30	0.683	0.854	1.055	1.310	1.697	2.042	2.457	2.750	3.646
40	0.681	0.851	1.050	1.303	1.684	2.021	2.423	2.704	3.551
60	0.679	0.848	1.046	1.296	1.671	2.000	2.390	2.660	3.460
120	0.677	0.845	1.041	1.289	1.658	1.980	2.358	2.617	3.373
∞	0.674	0.842	1.036	1.282	1.645	1.960	2.326	2.576	3.291

Statistical Formulas

$$s^2 = \frac{\sum_{k=1}^{n} x_i^2 - \frac{\left(\sum_{k=1}^{n} x_i\right)^2}{n}}{n-1}$$

$$s_{\bar{x}} = \sqrt{\frac{s^2}{n}\left(1-\frac{n}{N}\right)}$$ Where $\left(1-\frac{n}{N}\right)$ only used on finite populations.

$$SE\% = \left(\frac{t_{n-1,\alpha} s_{\bar{x}}}{\bar{x}}\right) * 100\%$$

$$\bar{x} \pm (t_{n-1,\alpha}) s_{\bar{x}}$$

$$CV\% = \frac{\sqrt{s^2}}{\bar{x}} * (100\%)$$

Point and Double Point Sampling:

Plot Radius Factor(PRF) - the factor a tree's dbh is multiplied by to determine its plot radius

$$PRF = \frac{8.696}{\sqrt{BAF}}$$

Plot Radius(PR) - a tree must be within this radius to be an in-tree

$$PR = (PRF)(dbh)$$

Basal Area Factor(BAF) - basal area per acre represented by each in-tree

$$BAF = \frac{75.625}{PRF^2}$$

Basal Area Per Acre(BA) - basal area per acre represented by the in-trees at a point

$$BA = (\text{IN-TREE COUNT})(BAF)$$

Number Of Trees Factor(NTF) - number of trees per acre (also called PACF) represented by an in-tree on a point

$$\text{NTF} = \frac{\text{BAF}}{(\text{Tree basal area})} = \frac{\text{BAF}}{.0054541(\text{dbh}^2)} = \frac{183.3483\text{BAF}}{\text{dbh}^2}$$

Volume Per acre(VPA) - volume per acre represented by an in-tree at a point

$$\text{VPA} = (\text{NTF})(\text{Tree volume}) = (\text{VBAR})(\text{BAF})$$

Double point, volume estimate Regression adjustment formula

$$\overline{Y_{adj}} = \bar{y} + b(X' - X) = \bar{y} + b(BA - ba)$$

where:

$$b = \frac{\sum XY - \frac{\sum X \sum Y}{n}}{\sum X^2 - \frac{(\sum X)^2}{n}} = \frac{\sum xy}{\sum x^2} = \frac{S_{xy}}{S_{xx}}$$

b= slope of regression = change in volume per 1 square foot of basal area
BA = large sample basal area per acre (count plus volume points)
ba = small sample basal area per acre (volume points only)