

Average: 3.70/5

FSTY 405 — Silviculture II

Midterm, 22nd October 2003

Name:

Student number:

- Ensure that your name and student number are correctly entered above.
- Answer in the spaces provided, writing down clearly any intermediate steps. Use the reverse as scratch pad.
- Write clearly, and use ink, not pencil.
- Pages: 4. Questions: ~~4~~⁵, worth 1 mark each.
- Time: 45 minutes.
- Info: $\ln xy = \ln x + \ln y$, $\ln x^y = y \ln x$, $y = \ln x \Leftrightarrow x = e^y$, $e^{x+y} = e^x e^y$

1. Fill in the blanks:

Aug. 0:71

Age (years)	Yield (m ³ /ha)	PAI (m ³ /ha-yr)	MAI (m ³ /ha-yr)
3096.....4.8.....	3.2
40	1445.6.....3.6.....
50200.....	4.0.....

(Note that changes are in-between ages).

2. An empirical yield table is one based on stands

0.74

- (a) in good quality sites
- (b) well stocked
- (c) with no mortality
- (d) representative of the average
- (e) thinned
- (f) characterized by a density index
- (g) uneven-aged

Answer (letter):d.....

3. We have the following relationship between top height (H , metres) and age (A , years):

0.82

$$\ln H = a - b/\sqrt{A},$$

where $b = 11.3$, and a varies with site quality. The site index (base age

50) is 21. Estimate the top height at age 28.

Method 1:

$$\ln H = a - 11.3/\sqrt{28} \quad (1)$$

$a?$

$$\ln 21 = a - 11.3/\sqrt{50} \Rightarrow a = \ln 21 + 11.3/\sqrt{50} = 4.6426$$

$$\text{Subst. in (1): } \ln H = 4.6426 - 11.3/\sqrt{28} \rightarrow H = 12.27 //$$

Method 2:

$$\ln H = a - 11.3/\sqrt{28}$$

$$\ln 21 = a - 11.3/\sqrt{50}$$

$$\text{Subtract: } \ln H - \ln 21 = -11.3/\sqrt{28} + 11.3/\sqrt{50} \rightarrow \ln H = \ln 21 - 11.3(1/\sqrt{50} - 1/\sqrt{28}) \dots$$

4. These are types of growth models: spatial, whole stand, individual-tree, distance-independent. From these, fill-in the correct items in the following classification scheme:

0.55

- (a) Whole stand
- (b) Individual-tree
 - i. Spatial
 - ii. Distance-independent

(No part marks).

5. We have a simple yield function

0.88

$$V = 20.4(H - 5.12),$$

with a site index model

$$H = 1.47S(1 - e^{-0.022t})^{0.5}.$$

V is volume in m^3/ha , H top height in metres, t age in years, and S is the site index.

For site index 20, at what age do we get a volume of 300 m³/ha?

$$20.4 (H - 5.12) = 300$$

$$H - 5.12 = 300/20.4 \rightarrow H = 300/20.4 + 5.12 = 19.826$$

$$H = 1.475 (1 - e^{-0.022t})^{0.5}$$

$$\frac{H}{1.475} = (1 - e^{-0.022t})^{0.5}$$

$$\left(\frac{H}{1.475}\right)^2 = 1 - e^{-0.022t}$$

$$e^{-0.022t} = 1 - \left(\frac{H}{1.475}\right)^2$$

$$-0.022t = \ln\left[1 - \left(\frac{H}{1.475}\right)^2\right]$$

$$t = -\ln\left[1 - \left(\frac{H}{1.475}\right)^2\right] / 0.022$$

$$= -\ln\left[1 - \left(\frac{19.826}{1.47 \cdot 20}\right)^2\right] / 0.22 = 27.57 //$$