FSTY 405 — Forest Growth and Yield

Midterm, 21 October 2008

Name:

- Answer in the spaces provided, writing down clearly any intermediate steps. Use the reverse as scratch pad. Writing just the final numerical answer is *not* acceptable.

- Write legibly, and use ink, not pencil.

- Answer clearly and to the point. Nonsense will be penalized.

- Pages: 5. Questions: 4, worth 1 mark each.

- Time: 45 minutes.

- Info (you may or may not need this):
  $a^x a^y = a^{x+y}$, $(a^x)^y = a^{xy}$, $y = a^x \Leftrightarrow x = \log_a y$,
  $\log_e x \equiv \ln x$, $e^x \equiv \exp(x)$,
  $\log_a xy = \log_a x + \log_a y$, $\log_a x^y = y \log_a x$.
  Area of circle of radius r: πr^2.

1. For ages up to 120 years, the VDYP volume equation is

$$V = b_0 + b_1 H + b_2 HA + b_3 H^2 C + b_4 AC \;,$$

where V is total volume (m^3/ha), H is top height (m), A is breast-height age (years), and C is canopy closure (%). The regression parameters for lodgepole pine are:

i:	0	1	2	3	4
b_i:	79.0	-10.5	0.0628	0.0235	-0.0830

Goudie's site index model, for site index 19 simplifies to:

$$H = 34.93 - 4613/(A^{1.285} + 137.2)$$

(the coefficients, except for 1.285, vary with site).

For site index 19 and 80% canopy closure, what is the MAI at 70 years breast-height?

2. What is, and what is the use of:

   (a) Zone of influence

   (b) Normal yield table

   (c) Expansion factor (in a growth model)
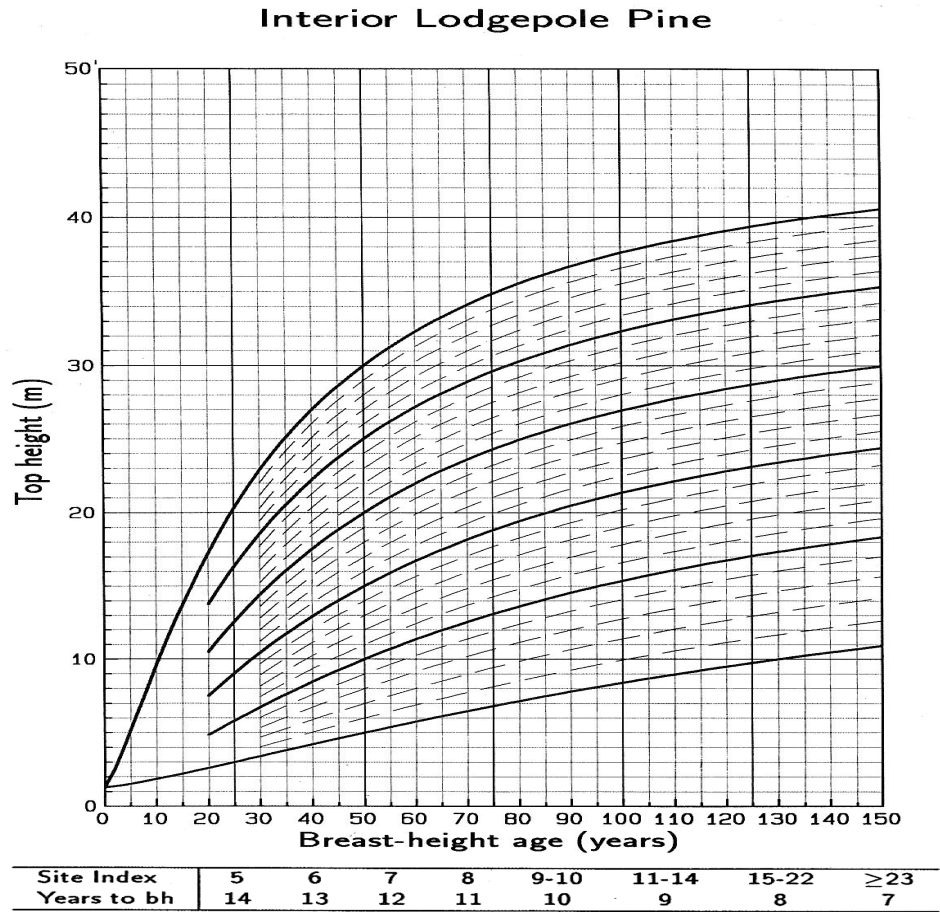
(d) Tree competition index

(e) State vector, state variable

3. Fill in the blanks:

Age (years)	Yield (m^3/ha)	PAI (m^3/ha-yr)	MAI (m^3/ha-yr)
30	. . . .		3.2
		. . . .	
40	144		. . . .
		5.6	
50	. . . .		. . . .

(Note that changes are on the intervals between ages).

4. With the following graph,

Interior Lodgepole Pine

Site Index	5	6	7	8	9-10	11-14	15-22	≥23
Years to bh	14	13	12	11	10	9	8	7

Mark any relevant points on the graph. Round values to the closest integer.

(a) Label the continuous curves with the corresponding site index on the right edge of the graph. Index age is 50 years (breast-height age).

(b) Estimate the site index for a stand of 21 metres at breast-height age 60: ....

(c) Find the age at which top height is 18 m in site 24: ....

(d) Predict the top height at 75 years **total age** for site 16: ....

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