Biology 4605 / 7220 Name _____Key_____
Quiz #6b 23 October 2007

1. According to Plotkin *et al.* (2000, *Proc. Natl. Acad. Sci* 97: 10850-10854) the number of tree species in a plot of area A in a tropical forest is:

$$S = S(1\ ha) \cdot A^{z} \cdot e^{-kA}$$

In the Pasoh forest reserve (Malaysia), z = 0.125 and k = $-5.66 \cdot 10^{-4}$.

In the Mudumalai Wildlife Sanctuary (India), z = 0.161 and k = $-5.41 \cdot 10^{-4}$.

If S(1 ha) = 200 species, then compute the number of species expected in plots of area A=2 ha in the Pasoh reserve. S = ___218___[2]

The expected number in the mathematical sense, is: S = ___218.35___

The parameter k is small, and hence as an approximation can be taken as zero: $e^{-kA}=1$. Compute the approximate number of species S_{Approx} in plots of A=2 ha if k assumed to be zero. S_{Approx} = _____218.10_____[2]

Report the approximation relative to your first computation as a ratio.

Ratio = (S_{Approx} / S) = _____0.998869_____[1]

2. If we define lnR = ln(S(A) / S(A=1ha), then

$$\ln R = z \cdot \log_e(A) + k \cdot A$$

Write the H_o/H_A pair for the testing whether the parameter k differs from zero. [2]

H_A: $k \neq 0$

H_o: $k = 0$

3a. For the following general linear model (ANCOVA) write in below each term the degrees of freedom, where the categorical variable *Location* consists of four sites and there are 48 observations.

[5]

$$\ln R - \beta_0 = \beta_{Loc} \cdot Location + \beta_A \cdot \ln A + \beta_{A*Loc} \cdot \ln A \cdot Location + \text{error}$$

$$48 - 1 = 3 + 1 + 3 + 40$$

3b. Complete an ANOVA table for this ANCOVA, where the SS for the regression variable is 200, the SS for the categorical explanatory variable *Location* is 300, the SS for the error term is 800, the SS for the interaction term is 120, and there are 48 observations that contribute to the total degrees of freedom. [MS: 1] [F: 1]

Source	df	SS	MS	F
Location	3	300	100	5
Area	1	200	200	10
Loc*Area	3	120	40	2
Error	40	800	20	
Total	47			