Mid-term Quiz, Survival Analysis I, Sept. 20, 2011

Your Name:_____

Denote by T a survival time variable and C a censoring time variable. Denote by $S(t)$ and $\lambda(t)$ respectively the survival and hazard function of T. Answer the following questions.

1. Choose correct answers (multiple choices): _____

   Suppose the distribution of T is continuous.

   (a) The value of pdf $f(t)$, $t \geq 0$, must be non-negative.
   (b) The value of hazard function $\lambda(t)$, $t \geq 0$, must be non-negative.
   (c) The value of pdf $f(t)$ is between 0 and 1, that is, $0 \leq f(t) \leq 1$.
   (d) The value of hazard function $\lambda(t)$ is between 0 and 1, that is, $0 \leq \lambda(t) \leq 1$.

2. Choose correct answers (multiple choices): _____

   Suppose the distribution of T is discrete.

   (a) The value of pdf $f(t)$, $t \geq 0$, must be non-negative.
   (b) The value of hazard function $\lambda(t)$, $t \geq 0$, must be non-negative.
   (c) The value of pdf $f(t)$ is between 0 and 1, that is, $0 \leq f(t) \leq 1$.
   (d) The value of hazard function $\lambda(t)$ is between 0 and 1, that is, $0 \leq \lambda(t) \leq 1$.

3. Choose correct answers (multiple choices): _____

   (a) The probability structure of T can be completely determined by its survival function.
   (b) The probability structure of T can be completely determined by its probability density function.
   (c) The probability structure of T can be completely determined by its hazard function.
   (d) Modeling the hazard function is a valid approach for statistical modeling.

4. Choose correct answers (multiple choices): _____

   Suppose T follows the Exponential distribution with the parameter $\theta > 0$. It is known that the pdf of T is $f(t) = \theta e^{-\theta t} I(t \geq 0)$ and the survival function of T is $S(t) = e^{-\theta t}$, for $t \geq 0$. Suppose survival data are observed subject to independent censoring. Based on survival data $0.54, 2.32^+, 1.50^+$, the likelihood function is

   (a) $L = (e^{-0.54 \cdot \theta}) \cdot (\theta e^{-2.32 \cdot \theta}) \cdot (\theta e^{-1.50 \cdot \theta})$
   (b) $L = (\theta e^{-0.54 \cdot \theta}) \cdot (e^{-2.32 \cdot \theta}) \cdot (e^{-1.50 \cdot \theta})$
   (c) $L = (\theta e^{-0.54 \cdot \theta}) \cdot (\theta e^{-2.32 \cdot \theta}) \cdot (\theta e^{-1.50 \cdot \theta})$
   (d) $L = (\theta e^{-0.54 \cdot \theta})$

5. Choose correct answers (multiple choices): _____

   For the Kaplan-Meier estimates/curves we discussed in class, what does the Kaplan-Meier curve estimate?

   (a) Survival function
   (b) Hazard function
   (c) Probability density function
   (d) All of them

6. Let $h_0(t)$ and $h_1(t)$ respectively be the hazard function for continuous failure times T_0 and T_1. Let $S_0(t)$ and $S_1(t)$ be their respective survival functions.

   Choose a correct answer (single choice): _____
   If the two hazards functions do not cross-over at any time $t > 0$, it implies that the two survival functions
   (a) definitely do not cross-over for $t > 0$
   (b) could still cross-over each other at certain $t > 0$

   Choose a correct answer (single choice): _____
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