One hundred identical devices are tested, and the test is terminated after 50 days, at which time 42 of them have failed. Assumption: The device has a lifetime with Weibull distribution.

**Indicate “+” for true, “o” for false.**

___ 1. To estimate the time at which 90% of the devices will have failed, evaluate $1 - F(0.90)$.
___ 2. The quantity $R_t$ is the fraction of the devices which have survived until time $t$.
___ 3. To estimate the Weibull parameters $u$ & $k$ for this particular device, we may use the “Method of Moments”.
___ 4. The Weibull CDF, i.e., $F(t)$, gives, for each device, the probability that it has failed at time $t$.
___ 5. The time between the failures in the group of 200 units was assumed to have the Weibull distribution.
___ 6. The **secant method** is a method for solving a nonlinear equation.
___ 7. A value of $k>0$ indicates an increasing failure rate, while $k<0$ indicates a decreasing failure rate.
___ 8. The slope of the straight line fit by linear regression to the data will be the estimate of the shape parameter $k$.
___ 9. In general, given only the coefficient of variation (i.e., the ratio $\sigma/\mu$) for the Weibull distribution, the shape parameter $k$ can be determined.
___ 10. The method used in homework #6 to estimate the Weibull parameters $u$ & $k$ requires that the motors be tested until all have failed.
___ 11. The CDF of the failure time of a motor is assumed to be $F(t) = 1 - e^{-t/u}^k$ for some parameters $u$ & $k$.
___ 12. The $p_i$ of a motor failing in the time interval $[t_{i-1},t_i]$ is $F(t_i) - F(t_{i-1})$ where $F(t)$ is the CDF of the failure time distribution.
___ 13. In the chi-square goodness-of-fit test, the number of degrees of freedom is never more than the number of “cells” of the histogram.
___ 14. If the assumption of Weibull distribution were correct, a plot of $N_f(t)$ vs. $t$ should be approximately on a straight line.
___ 15. If the failure rate is decreasing, it may be more appropriate to use the **Gumbel** distribution than the Weibull.
___ 16. In the chi-square goodness-of-fit test, the number of degrees of freedom is equal to the number of “cells” of the histogram (in this case, 8).
___ 17. If 10 units of this device are installed in a facility, the number still functioning after 50 days has a Weibull distribution.

**Part II: Multiple choice:** Let $t_i$ be the time of the $i^{th}$ failure, $F_i = i/N$, and $R_i = 1 - F_i$.

When plotting the points to fit a straight line in order to estimate $k$ & $u$ for the **Weibull** distribution,

___ 18. The vertical axis should represent ...
___ 19. The horizontal axis should represent ...
___ 20. The slope of the line should be approximately ...
___ 21. The vertical intercept (y-intercept) of the line should be approximately ...

| a. $t$ | b. $F$ | c. $\ln t$ | d. $\ln R$ | e. $\ln \ln t$ | f. $\ln 1/t$ | g. $\ln 1/R$ | h. $\ln(\ln 1/R)$ | i. $\ln u$ | j. $\ln k$ | k. $k$ | l. $u$ | m. $-k u$ | n. mean $\mu$ | o. standard deviation $\sigma$ | p. coefficient of variation | q. $ku$ | r. $k \ln u$ | s. $-k \ln u$ | t. None of the above |