Assignment 03

This assignment conssits of 6 problems. Problems 1, 2 are from 129 page. Problem 6 of 148 page and problems 5, 6, 7 of 153 page.

Problem #1:
The failure rate of a certain component is *h(t)* $= \lambda_0 t$, where $\lambda_0 > 0$ is a given constant. Determine the reliability, R(t), of the component. Repeat for $h(t) = \lambda_0 t^{1/2}$.

Problem #2:
The failure rate of a computer system for onboard control of a space vehicle is estimated to be the following function of time:

$$h(t) = \alpha\mu t^{\alpha-1} + \beta\gamma t^{\beta-1}$$

Derive an expression for the reliability *R(t)* of the system. Plot *h(t)* and *R(t)* as functions of time with parameter values $\alpha = \frac{1}{4}, \beta = \frac{1}{7}, \mu = 0.0004$, and $\gamma = 0.0007$.

Problem #6:
Plot the three-parameter Weibull distribution function[equation(3.33)] for $\lambda = 0.0001, \theta = 10$, and $\alpha = 0.5, 1, 2$. Repeat for the density function and the failure rate function.

Problem #5:
Consider an IBM DTCA-23240 type disk[IBM 1997]. Assume that the number of cylinders N to be traversed between two disk requests is a normally distributed random variable with $\mu = \frac{n}{3}$ and $\sigma^2 = n^2/18$, where n is the total number of cylinders. The seek time T is a random variable related to the seek distance N by

$$T = a + bN.$$

In the particular case of the IBM DTCA-23240, experimental data show a = 8ms, b = 0.00215 ms per cylinder, and n = 6,976. Determine the pdf of

T. Recalling that T is a nonnegative random variable whereas the normal model allows negative values, make appropriate corrections.

Problem #6:
Consider a normalized floating-point number in base (or radix) β so that the mantissa X satisfies the condition $1/\beta \leq X < 1$. Assume that the density of the continuous random variable X is 1/(x ln β).
(a) Show that a random deviate of X is given by the formula, β^{u-1} where u is a random number.
(b) Determine the pdf of the normalized reciprocal Y = $1/(\beta X)$.

Problem #7: Write down formulas to generate random deviates of the log-logistic, the Pareto and the defective expoinential [equation(3.49)] distributions.