1. A computer manufacturer uses chips from 3 sources. Chips from sources A, B and C are defective with probabilities 0.1, 0.2 and 0.3, respectively. If a randomly selected chip is found to be non-defective, what is the probability that the chip is not coming from manufacturer B? [4]

2. For the Poisson random variable with parameter α, show that (i) for α < 1, \( P[N = k] \) is maximum at \( k = 0 \); (ii) for α > 1, \( P[N = k] \) is maximum at \( \lfloor α \rfloor \), (the floor value of α). How to modify the result when α happens to be a positive integer? [4]

3. (a) State the memoryless property of an exponential distribution.
(b) Suppose that the number of hours that a light bulb can service is exponentially distributed with an average value of 10 hours. At this moment, a light bulb has been working in the past 6 hours, what is the probability that it continues to function for the next 2 hours? [3]

4. (a) Describe the relation between the failure rate function and the reliability function.
(b) A device has the failure rate function

\[
    r(t) = \begin{cases} 
        1 & 0 \leq t < 10 \\
        1 + 10(t - 10) & t \geq 10 
    \end{cases}
\]

Find the reliability function and the probability density function of the device. [2]

5. The probability density function of a random variable \( T \) is given by

\[
    f_T(t) = \begin{cases} 
        \lambda e^{-\lambda(t-T_0)} & t \geq T_0 \\
        0 & t < T_0 
    \end{cases}
\]

Find the probability density function of the random variable \( X = 4 - 5T \). [3]

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