Q4

1) Mean, $\mu = 24$

Standard deviation, $\sigma = 12$

So, $\lambda = \frac{\mu}{\sigma^2} = \frac{24}{12^2} = \frac{1}{6}$

$\sigma = \frac{24^2}{12^2} = 4$

a) Probability that a transistor will last between 12 and 24 weeks is

$P(12 \le Y \le 24) = P(0 \le 4 \le 24) - P(0 \le 4 \le 12)$

So, now, $v_1 = \lambda t_1 = \frac{1}{6} \times 24 = 4$

$v_2 = \lambda t_2 = \frac{1}{6} \times 12 = 2$

So, $I_4(v_1) - I_4(v_2)$

$= 0.56653 - 0.14288$

$\approx 0.42365$ Ans.

b) Probability that transistor will last at most 24 weeks.

ie $P(0 \le 4 \le 24) = I_4\left(\frac{1}{6} \cdot 24\right) = I_4(4)$

$= 0.5665 \approx 0.5167$ (Ans)

The median of distribution is less than 24 since we know that $P(4 \le \tilde{\mu}) = 0.5$

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c) $P(x \leq x_{0.99}) = 0.99$

$P(x \leq x_{0.99}) = F(x_{0.99}; 4, 6) = F\left(\frac{x_{0.99}}{6}; 4\right)$

$n = 4$ and value $= 0.99$

$\Rightarrow$ $x =$ 10th row

$\frac{x_{0.99}}{6} = 10$

$x_{0.99} = 60$

d) $P(x \leq t) = 0.995$

$P(x \leq t) = F(t; 4, 6) = F\left(\frac{t}{6}; 4\right)$

$n = 4$ and value $= 0.995$

$x =$ 11 row

$\frac{t}{6} = 11$

$\Rightarrow t = 66.$

11) Let $x$ be reaction time

$\mu = 1.25$ & $\sigma = 0.46$

So, $1.1 \leq x \leq 1.5$

So, $\frac{1.1 - 1.25}{0.46} \leq \frac{x - 1.25}{0.46} \leq \frac{1.5 - 1.25}{0.46}$

So,

$P(1.1 \leq x \leq 1.5) = P(-0.32 \leq z \leq 0.543)$

$= \phi(0.543) - \phi(-0.32) = (1 - 0.2946) - 0.3745$

$= 0.3309$

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