Session 14: Additional Exercise

Problem Statement 1:-

Here $X = D$ & $x = d$ and $f(x) = 20 e^{-20(x-12.5)}$

given $x \geq 12.5$.

* Proportion is scrapped:-

$$P(12.5 < x < 12.6) = \int_{12.5}^{12.6} f(x)\,dx$$

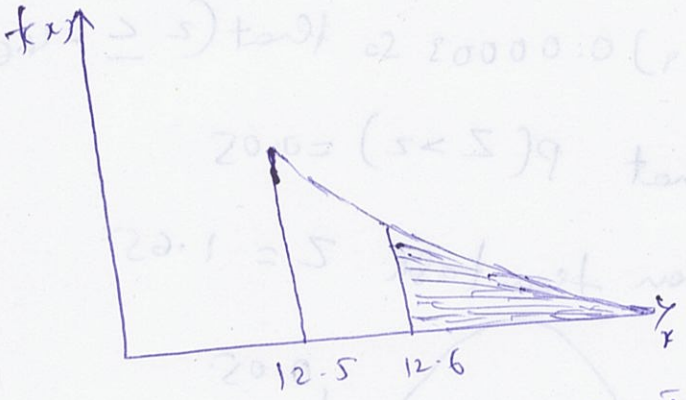
$$= \int_{12.5}^{12.6} -e^{-20(x-12.5)} \cdot dx$$

$$= 0.865$$

* CDF when diameter is of 11 mm.

$$= \int_{11}^{11} f(x)\,dx = \int_{11}^{11} -e^{-20(x-12.5)} \cdot dx$$

$$= 0$$



If you look at the graph the function $f(x)$ defined over intervals 12.6 to ∞. for $x \leq 12.5$. Since all the probability accumulated for x beyond 12.6.

$F(x) = 1$ for $x \geq 12.5$ & $x \leq 12.6$

Problem Statement 2;

(a) $P(Z > 1.26)$

$= 1 - P(Z \leq 1.26)$

$= 1 - 0.89616 = 0.10384.$

(b) $P(Z < -0.86)$, (from z table)

$= 0.19490$

(c) $P(Z > -1.37)$

$= P(Z < 1.37) = 0.91465.$

(d) $P(-1.25 < Z < 0.37)$

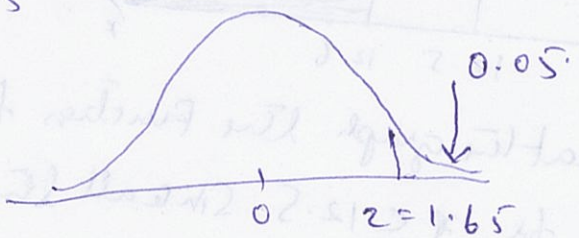
$= P(Z < 0.37) - P(Z < -1.25)$

$= 0.64431 - 0.10565 = 0.53866$

(e) $P(Z \leq -4.6)$ cannot be found exactly from the standard table From table $P(Z \leq -3.99) 0.00003$ so that $(Z \leq -4.6) \approx Z$

(f) Find the value z such that $P(Z > z) = 0.05$

$P(Z < z) = 0.95$ then from table $Z = 1.65$



(g) Find the value of z such that $P(-z < Z < z) = 0.99$

$Z = 2.58$

Problem statement 3 :-

$$P(x \geq 13) = P\left(\frac{(x-10)}{2} \geq \frac{(13-10)}{2}\right) = P(z > 1.5)$$

$$= 0.06681$$

$$P(x > 13) = P(z > 1.5) = 1 - P(z \leq 1.5)$$

$$= 1 - 0.93319 = 0.06681$$

Distribution of $Z = \frac{x-\mu}{\sigma}$

① what is the probability that a current measurement is between 9 and 11 (in mA)

$$P(9 < x < 11) = P((9-10)/2 < (x-10)/2 < (11-10)$$

$$= P(-0.5 < z < 0.5) = P(z < 0.5) - P(z$$

$$= 0.69146 - 0.30854 = 0.38292$$

Determine the current measurement which has a probability of 0.98.

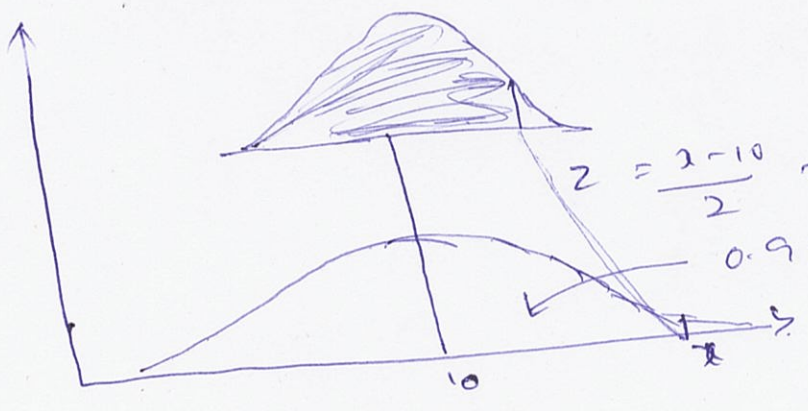
$$P(x < x) = P((x-10)/2 < (x-10)/2).$$

$$= P(z < (x-10)/2)$$

$$= 0.98$$

$$P(z < 2.05) = 0.97982$$

$$x = 2(2.05) + 10 = 14.1 \text{ mA}.$$



Problem statement 4)

Let x denote the shaft diameter in inches.

$$P(0.2485 < x < 0.2515)$$

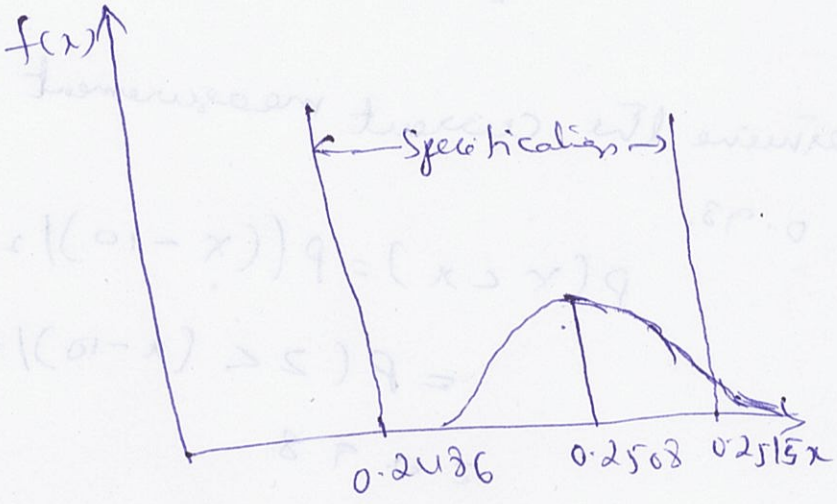
$$= P\left(\frac{0.2485 - 0.2503}{0.0005} < Z < \frac{0.2515 - 0.2503}{0.0005}\right)$$

$$P = (-4.6 < Z < 1.4)$$

$$= P(Z < 1.4) - P(Z < -4.6)$$

$$= 0.91924 - 0.0000$$

$$= 0.91924$$



If x is less than 0.0015 then value will be 0.