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Section-6

Q1 (a) The following test of significance of difference of means are given below :-

- Given two independent samples $x_1, x_2, x_3, \ldots\ldots x_{n_1}$ and $y_1, y_2, y_3, \ldots\ldots y_{n_2}$ with means $\bar{x}$ & $\bar{y}$ and standard deviations σ_x & σ_y from a normal populations with the same variances, we have to test the hypothesis that the population mean μ_1 & μ_2 are the same.

- for this, we calculate,

$$t = \frac{\bar{x} - \bar{y}}{\sigma \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \quad \text{——} (1)$$

where,

$$\bar{x} = \frac{1}{n_1} \sum_{1}^{n_1} x_i \text{ &}$$

$$\bar{y} = \frac{1}{n_2} \sum_{1}^{n_2} y_i$$

and

$$\sigma_s^2 = \frac{1}{n_1 + n_2 - 2} \left[(n_1 - 1)\sigma_x^2 + (n_2 - 1)\sigma_y^2 \right]$$

$$= \frac{1}{n_1 + n_2 - 2} \left\{ \sum_{1}^{n_1} (x_i - \bar{x})^2 + \sum_{1}^{n_2} (y_i - \bar{y})^2 \right\}$$

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- It can be shown that the variate 't' defined by eqn. (1) follows that the "t-distribution" with n_1+n_2-2 degree of freedom.
- If the calculated value of $t > t_{0.05}$, the difference blw the sample means is said to be significant at 5% level of significance.
- If $t > t_{0.01}$, the difference is said to be significant at 1% level of significant.
- If $t < t_{0.05}$, the data is said to be consistent with hypothesis, that $\mu_1 = \mu_2$.

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(b) Here, we have no. of cloth pieces = 15

(i) The total no. of defects (C) :-

$$= 7+12+3+20+21+5+4+3+10+8+0+9+6+7+20$$

$$\boxed{(C) = 135}$$

(ii) The average no. of defects ($\bar{c}$) :-

$$\bar{c} = \frac{\text{Total no. of defects}}{\text{Total no. of samples}} = \frac{\Sigma C}{n} = \frac{135}{15}$$

$$\boxed{\bar{c} = 9}$$

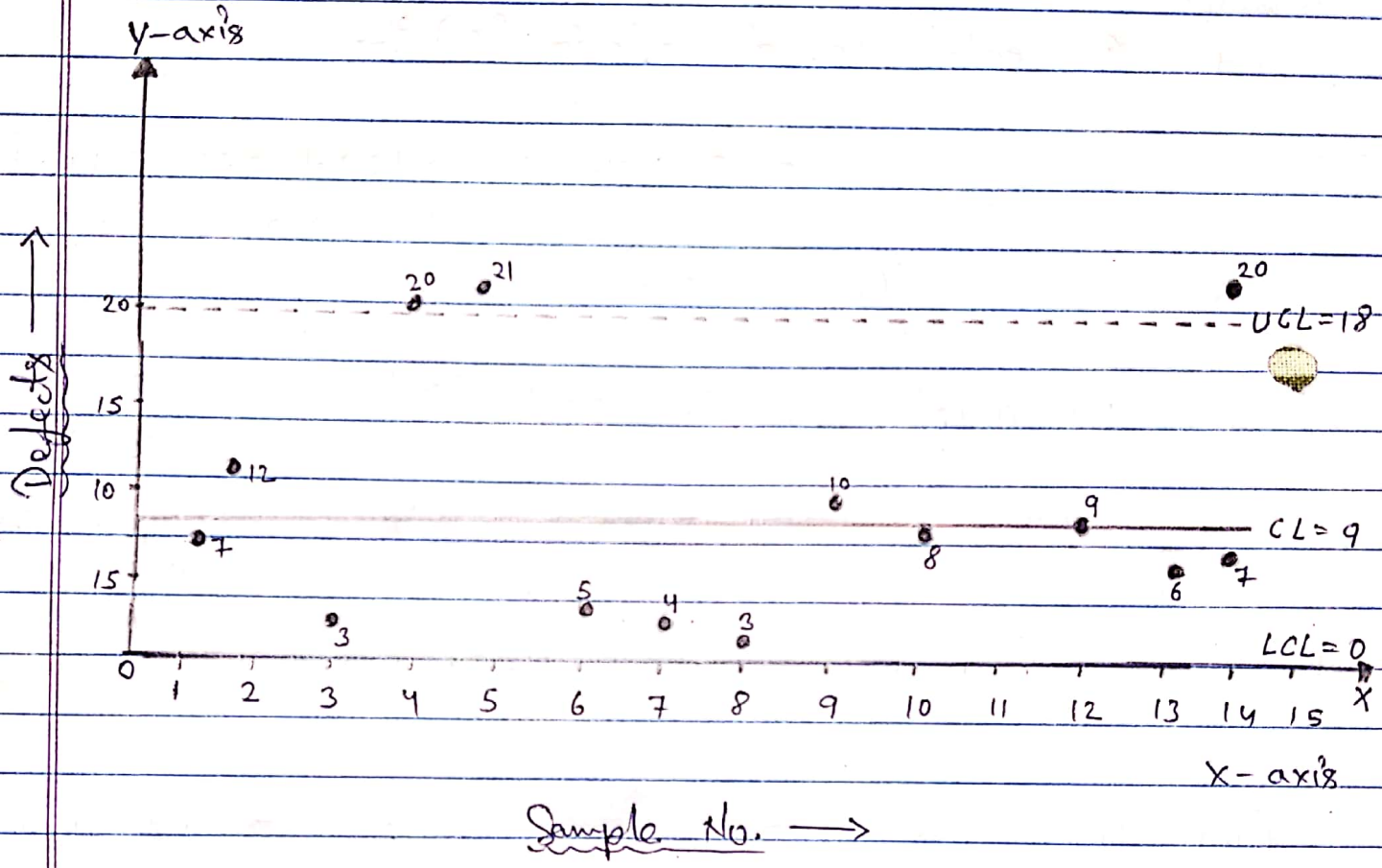
(iii) The 3-σ control limits for C-chart are given by :-

- Control Limit line = $\bar{c} = 9$
- $UCL = \bar{c} + 3\sqrt{\bar{c}} = (9 + 3\sqrt{9}) = 9+9$

$$\boxed{UCL = 18}$$

- $LCL = \bar{c} - 3\sqrt{\bar{c}} = (9 - 3\sqrt{9}) = 9-9$

$$\boxed{LCL = 0}$$



- Since three sample points are outside the limits, the process is not under statistical control.

Ans.