Assignment 02

1. There are three groups of people have average earnings $\$\mathbf{150}$, $\$\mathbf{170}$ & $\$\mathbf{140}$ respectively. If the first two groups contain $\mathbf{17}$ & $\mathbf{12}$ people respectively and the combined average of earnings is $\$\mathbf{153.25}$, find the number of people in the last group.

2. In a certain factory there are four working groups and they need $\mathbf{3}$, $\mathbf{4}$, $\mathbf{5}$ and $\mathbf{2}$ hours per product to make. What is the approximate average time required to make a product by those groups?

3. Let the class marks of a certain population table are $\mathbf{17}$, $\mathbf{22}$, $\mathbf{27}$, $\mathbf{32}$ & $\mathbf{37}$ and the corresponding frequencies are $\mathbf{9}$, $\mathbf{13}$, $\mathbf{8}$, $\mathbf{10}$ & $\mathbf{15}$.

- **(i)** Construct the original classes.
- **(ii)** Draw the histogram.
- **(iii)** Find the mode graphically.

4. Consider the following classes.

Class	43-47	48-52	53-57	58-62	63-67
Frequency	9	8	12	6	15

- **(i)** Sketch the histogram and derive frequency polygon from it.
- **(ii)** Sketch the Pie chart.
- **(iii)** Find the cumulative frequency polygon. Hence, locate the $\boldsymbol{D_7}$ and $\boldsymbol{Q_1}$.
- **(iv)** Evaluate $\boldsymbol{Q_3}, \boldsymbol{Me}, \boldsymbol{D_7}, \& \boldsymbol{P_{87}}$ from the cumulative frequency polygon.
- **(v)** Find the Mode and mean deviation from the mode.
- **(vi)** Find the harmonic and geometric mean.
- **(vii)** Find the standard deviation and its coefficient.

5. If the mode of a certain frequency table is $\mathbf{65.5}$ and the lower limit of the modal class is $\mathbf{60.5}$ with the class size $\mathbf{10}$, find the frequency of the modal class. Here frequency difference of the modal class and pre-modal class is $\mathbf{7}$ and frequency of post-modal class is $\mathbf{14}$.

6. If the standard deviation of a frequency table is $\mathbf{3.6}$ and coefficient of standard deviation is $\mathbf{6.55}\%$, find the arithmetic mean of that table.

7. Suppose the first four raw moments of a population are $\mathbf{-3.7}$, $\mathbf{94}$, $\mathbf{-547.2}$ & $\mathbf{1200}$ respectively.

- **(i)** Find the first four central moments.
- **(ii)** Estimate the coefficient of skewness and kurtosis.
- **(iii)** Comment about your findings.
- **(iv)** Show your result graphically.

8. If the correlation coefficient of two variables is $\mathbf{0.65}$ and regression coefficient of $\boldsymbol{y}$ on $\boldsymbol{x}$ is $\mathbf{1.68}$. Also, $\overline{\boldsymbol{x}} = \mathbf{32.3}$ and $\overline{\boldsymbol{y}} = \mathbf{45.6}$.

- **(i)** Find the regression coefficient of $\boldsymbol{x}$ on $\boldsymbol{y}$.
- **(ii)** Find and sketch the regression line $\boldsymbol{x}$ on $\boldsymbol{y}$.
- **(iii)** Predict the value of $\boldsymbol{x}$ when $\boldsymbol{y}$ is $\mathbf{52}$. Also, verify your result graphically.

9. If the correlation coefficient of $\boldsymbol{x}$ & $\boldsymbol{y}$ is $\mathbf{0.75}$ and the corresponding standard deviations $\mathbf{1.25}$ & $\mathbf{1.75}$. Find the regression coefficient of $\boldsymbol{y}$ on $\boldsymbol{x}$ and $\boldsymbol{x}$ on $\boldsymbol{y}$.

10. For the following data, find the correlation co-efficient. How much $\boldsymbol{x}$ depends on $\boldsymbol{y}$? Determine and sketch the corresponding regression line. Graphically find the value of $\boldsymbol{x}$ when $\boldsymbol{y = 15}$.

$\boldsymbol{x}$	5	12	18	23	27	30	26	22
$\boldsymbol{y}$	18	16	13	11	9	7	10	13

11. A company produces electric bulbs whose average life time is $\mathbf{180}$ days and average variation $\mathbf{10}$ days. It is claimed that, in a newly developed process the mean life time can be increased.

(a) Design a decision rule for the process at the $\mathbf{0.05}$ significance to test $\mathbf{100}$ bulbs.
(b) What about the decision if the average life time of a bulb **(i)** $\mathbf{184}$ days **(ii)** $\mathbf{187}$ days?
(c) If the new process has increased the mean life time to $\mathbf{185}$ days. Find $\boldsymbol{\alpha}$ and $\boldsymbol{\beta}$ for the estimated mean $\mathbf{183}$ days for $\mathbf{80}$ samples.
(d) If the estimated average life time for $\mathbf{55}$ samples is $\mathbf{184}$ days, find the $\boldsymbol{p}$-value of the claim of the manufacturer.

12 Design a decision rule to test the hypothesis that a die is fair if we take a sample of $\mathbf{150}$ trials for the die to get even/odd faces and use $\mathbf{0.01}$ as the significance level. **Predict** the acceptance and critical region.

13. Design a decision rule to test the hypothesis that a coin is fair if we take a sample of $\mathbf{120}$ trials of the die to get head/tail and use $\mathbf{0.1}$ as the significance level. **Predict** the acceptance and critical region.

14. A company produces an electric tool whose average life time is $\mathbf{260}$ days and variance $\mathbf{169}$ days. It is claimed that, in a newly developed process the mean life time can be increased. If the new process has increased the mean life time to $\mathbf{276}$ days, assuming a sample of $\mathbf{80}$ bulbs with estimated life time $\mathbf{269}$ days, find $\boldsymbol{\alpha}$ and $\boldsymbol{\beta}$.

15. A pharmaceutical company produces a new medicine and they claimed that it will reduce the migraine pain very fast with $\mathbf{85}\%$ accuracy. Design a decision rule for the process with the significance $\mathbf{0.01}$ by apply the medicine to $\mathbf{150}$ people.