PROB & STATISTICS

Assignment #01

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ROLL NO: 20K-0183

QUESTION 01

a)

i) Mean:

$$\frac{\begin{pmatrix} 128+119+95+97+124+125+142+95+105+120+ \\ 113+109+124+132+97+135+133+136+120+112+ \\ 146+128+103+135+114+109+100+111+131+113+ \\ 124+131+133+131+88+118+116+95+112+135+ \\ 100+112+111+150+117+122+97+116+92+122 \end{pmatrix}}{50}$$

$$= \frac{5891}{50}$$

$$\boxed{\text{Mean} = 117.82}$$

ii) Median:

Arranging Data in ascending order first:

88, 92, 95, 97, 97, 97, 98, 98, 100, 100

103, 106, 107, 107, 111, 111, [112] 112, 112, 113,

113, 114, 116, 116, 117, 118, 119, 120, 120, 122,

122, [124] 124, 124, 128, 128, 128, 131, 131, 131

132, 133, 133, 135, 136, 138, 138, 142, 146, 150

$$\text{Median} = \frac{117 + 118}{2} = 117.5$$

$$\boxed{\text{Median} = 117.5}$$

iii) Mode:

This is a multimodal distribution with the modes being,

$$\boxed{\text{modes} = 97, 112, 124, 128, 131}$$

b)

Range:

$$\text{Range} = R_m - R_L$$

$$= 150 - 88$$

$$\boxed{\text{Range} = 62}$$

Variance:

$$\sigma^2 = \frac{(88-117.82)^2 + (92-117.82)^2 + (95-117.82)^2 \ldots (150-117.82)^2}{50}$$

$$= \frac{4797.644 + 689.524 + 73.524 + 964.054 + 4516.404}{50}$$

$$\boxed{\sigma^2 = 220.8276}$$

Standard Deviation:

$$\sigma = \sqrt{\sigma^2}$$

$$= \sqrt{220.8276}$$

$$\boxed{\sigma = 14.86}$$

c)

$$\bar{y} \pm S = 117.81 \pm 14.86 = (102.95, 132.67)$$

$$\bar{y} \pm 2S = 117.81 \pm 2(14.86) = (88.09, 147.53)$$

$$\bar{y} \pm 3S = 117.81 \pm 3(14.86) = (73.23, 162.39)$$

3) values lie in range of $\bar{y} \pm S$
48 values lie in range of $\bar{y} \pm 2S$
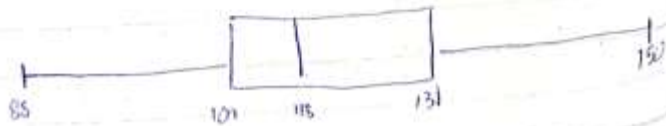50 values lie in rang of $\bar{y} \pm 3S$
No outlier were detected.

d)

$$Q_1 = \frac{(n+1)}{4} = \frac{51}{4} = 12.75 \approx 13 = 109$$

$$Q_2 = \frac{(n+1)}{2} = \frac{51}{2} = 25.5 = 118$$

$$Q_3 = \frac{3}{4}(n+1) = \frac{3(51)}{4} = 38.25 \approx 39^{th} = 131$$

Min 88

Max = 150

e)

70th percentile $= \frac{(n+1)}{100} \cdot 70 = \frac{51}{100} \cdot 70 = 35.7^{th}$ value

$$\boxed{P_{70} = 128}$$

QUESTION NO.02

a) part Descriptive Statistics:

a - Mean:

$$\bar{X} = \frac{(76 + 63 + 57 + \cdots\cdots + 77 + 82 + 59)}{44}$$

$$= \frac{738 + 693 + 794 + 746}{44}$$

$$\boxed{\bar{X} = 67.64}$$

b) - Median.

Arranging data in ascending order 99,65,
27, 40, 40, 42, 53, 43, 47, 50, 51, 55, 55, 65, 66, 69,
63, 63, 64, 66, 68, 64, 71, 72, 73, 74, 75, 75, 76, 77,
77, 77, 78, 78, 79, 80, 81, 81, 83, 86, 88, 78, 76, 95

$$= \frac{71 + 72}{2} = \frac{143}{2} = 71.5 \qquad \boxed{Median = 71.5}$$

c). Mode

      It is a bi-modal data distribution

$$\boxed{Modes = 68, 77}$$

d) Range.

$$Range = V_{max} - V_{min}$$
$$= 97 - 27$$

$$\boxed{Range = 70}$$

e) variance:

$$\sigma^2 = \frac{(27 - 67.64)^2 + (40 - 67.64)^2 + \cdots + (97 - 67.64)^2}{44}$$

$$= \frac{2656.22 + 2199.43 + 2706.55 + 3931.98}{44}$$

$$\boxed{\sigma^2 = 260.78}$$

f) Standard Deviation:

$$\sigma = \sqrt{\sigma^2}$$
$$= \sqrt{260.78}$$

$$\boxed{\sigma = 16.14}$$

b-part:

$$\sigma = 16.14$$
$$\mu = 67.64$$

A : mark $\geq \mu + 2\sigma$: $\boxed{Marks \geq 99.92}$

B: $\mu + \sigma \leq Marks < \mu + 2\sigma$

$$\boxed{83.78 \leq marks < 99.92}$$

C: $\mu \leq marks < \mu + \sigma$

$$\boxed{67.64 \leq marks < 83.78}$$
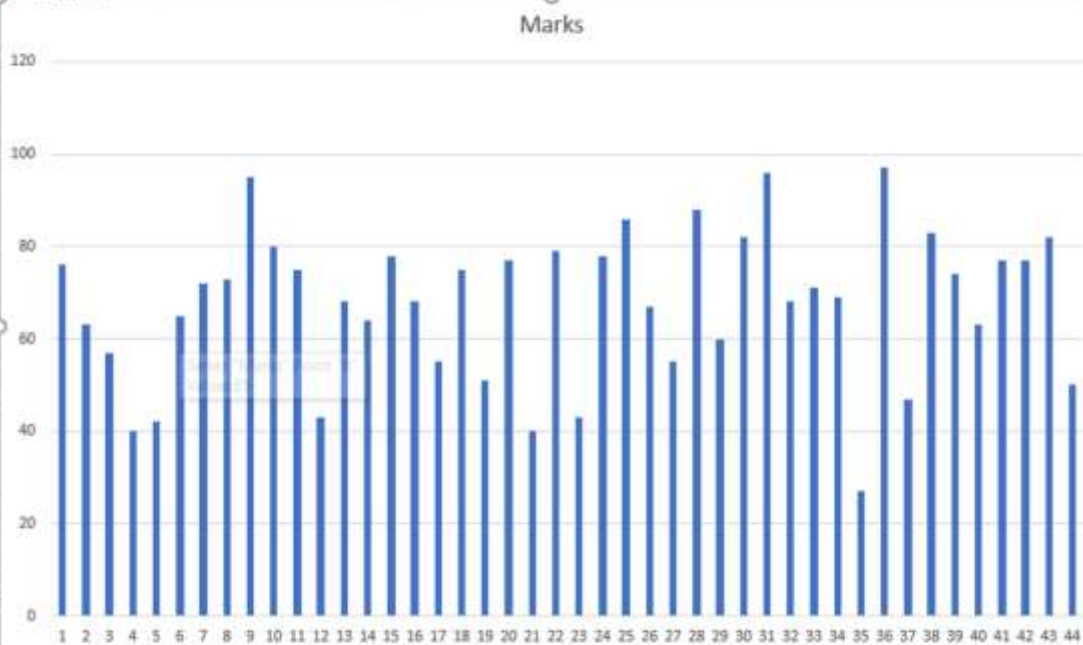
D: $\mu - \sigma \leq marks < \mu$

$$\boxed{51.5 \leq marks < 67.64}$$

E: $\mu - 2\sigma \leq marks < \mu - \sigma$

$$\boxed{35.36 \leq marks < 51.5}$$

F: $\mu - 3\sigma \leq marks < \mu - 2\sigma$

$$\boxed{19.22 \leq Marks < 35.36}$$

RANGE	MARKS.
A (marks $\geq$ 99.92)	ϕ
B (83.78 $\leq$ marks < 99.92)	86, 88, 95, 96, 97
C (67.64 $\leq$ marks < 83.78)	68, 68, 68, 69, 71, 72, 73, 74, 75, 75, 76, 77, 77, 77, 78, 78, 79, 80, 82, 82, 83
D (51.5 $\leq$ marks < 67.64)	55, 55, 63, 63, 64, 65, 67
E (35.36 $\leq$ Marks < 51.5)	27, 40, 40, 42, 43, 43, 47, 50, 51
F (19.22 $\leq$ Marks < 35.36)	27

c) Part

Bar chart:

Marks

By looking at the bar chart we can see that majority of the students lie in the 60 – 80 range.

Piechart:

Range: 70

no. of classes: 8

Class interval $= \frac{70}{8} \approx 10$

Class 01: $20 < x < 30$

Class 02: $30 < x < 40$

class 03: $40 < x < 50$

Class 04: $50 < x < 60$

class 05: $60 < x < 70$

class 06: $70 < x < 80$

class 07: $80 < x < 90$

Class 08: $x > 90$
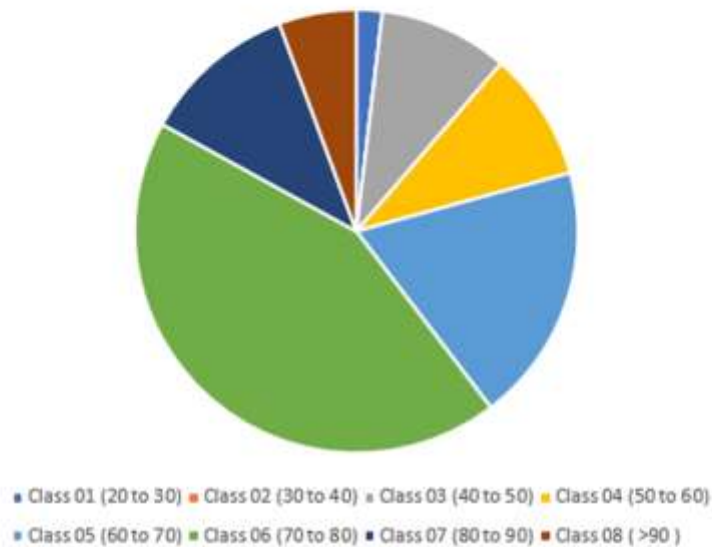

class 01 = 01 value

class 02: 0 values

class 03 = 5 values

class 04 = 5 values

class 05 = 10 values

class 06 = 23 values

class 07 = 6 values

class 08 = 3 values

Share of each class of student

- Class 01 (20 to 30)
- Class 02 (30 to 40)
- Class 03 (40 to 50)
- Class 04 (50 to 60)
- Class 05 (60 to 70)
- Class 06 (70 to 80)
- Class 07 (80 to 90)
- Class 08 (>90)

By taking a look at the chart we can clearly see that the majority of students secured marks in the 70 - 80 marks range, followed by the 60 - 70 marks range.