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Subject : Probability & Statistics
Section : B
Roll No. : 70

Question 1:

Solution:

(i) 4, 7, 9, 9, 11, 15, 18, 18, 18, 25

(a) Mean

$$\bar{x} = \frac{4+7+9+9+11+15+18+18+18+25}{10}$$

$$\bar{x} = \frac{134}{10}$$

$$\boxed{\bar{x} = 13.4}$$

(b) Median: $n = 10 \Rightarrow \frac{n+1}{2} = 5.5$

$$\boxed{M = 13}$$

(c) Mode: $\boxed{Z = 18}$

(d) Standard Deviation:

$$\sigma = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n}}$$

$$\sigma = \sqrt{\frac{(-9.4)^2 + (-6.4)^2 + (-4.4)^2 + (-2.4)^2 + (1.6)^2 + (4.6)^2 + (4.6)^2 + (4.6)^2 + (11.6)^2}{10}}$$

$\sigma = \sqrt{37.44}$ $\boxed{\sigma = 6.1188}$

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e) Inter Quartile Range :

$Q_1 = \frac{n+1}{4} = \frac{11}{4} = 2.75^{th}$ term

$Q_3 = \frac{3(n+1)}{4} = \frac{33}{4} = 8.25^{th}$ term

(ii)

| $x$ | $f$ | $xf$ | $cf$ |
|---|---|---|---|
| 0 | 5 | 0 | 5 |
| 1 | 11 | 11 | 16 |
| 2 | 26 | 52 | 42 |
| 3 | 15 | 45 | 57 |
| 4 | 3 | 12 | 60 |
| | 60 | 120 | |

(a) Mean $= \frac{xf}{\Sigma f} = \frac{120}{60} = \boxed{\bar{X} = 2}$

(b) Median $= \frac{n}{2} = 30$ $\boxed{M = 2}$

(c) Standard Deviation =

$$S.D = \sqrt{\frac{(X-\bar{X})^2}{n}}$$

$$S.D = \sqrt{\frac{4+1+0+1+4}{60}} = \sqrt{\frac{10}{60}} = \sqrt{\frac{1}{6}} = 0.408$$

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e) Inter- Quartile Range :

$Q_1 = \frac{n+1}{4} = \frac{11}{4} = 2.75^{th}$ term

$Q_3 = \frac{3(n+1)}{4} = \frac{33}{4} = 8.25^{th}$ term

(ii) ~~(a)~~

| $x$ | $f$ | $xf$ | $cf$ |
|---|---|---|---|
| 0 | 5 | 0 | 5 |
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(a) Mean $= \frac{xf}{\Sigma f} = \frac{120}{60} = \boxed{\bar{X} = 2}$

(b) Median $= \frac{n}{2} = 30$ $\boxed{M = 2}$

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$$S.D = \sqrt{\frac{(X-\bar{X})^2}{n}}$$

$$S.D = \sqrt{\frac{4+1+0+1+4}{60}} = \sqrt{\frac{10}{60}} = \sqrt{\frac{1}{6}} = 0.4082$$

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Ques. 3

Solution

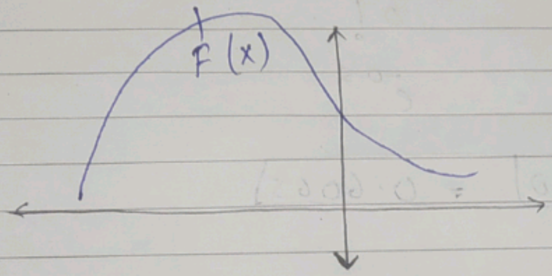
(i) $\bar{x} = 2^2$

$$\boxed{\bar{x} = 4}$$

$$V(x) = 2\bar{x} = 8$$

$$\boxed{S.D = 2.8284}$$

(ii)




The shape is above at +ve high peak at the left hand side.

(iii) $f_x(x) \Rightarrow x \sim Gamma\left(2, \frac{1}{2}\right)$

$$2\lambda x \sim \chi^2$$

$$\boxed{f_X(X) = P\left(0 < \chi^2 < \infty\right)}$$

Question 2.

Solution 2: $\lambda = 0.5$

(i) no claim arise $= x = 0$

$$P(X=0) = \frac{e^{-\lambda}\lambda^{x}}{x!}$$

$$= \frac{e^{-0.5}(0.5)^{0}}{0!}$$

$$= e^{-0.5}$$

$$\boxed{P(x=0) = 0.6065}$$

(iii) let A time until next claim

$A \sim (xp(0.5))$ at $x = 2$

$$P(A>2) = 1 - \int_0^2 0.5 e^{-0.5x} \cdot dx$$

$$= 1 - 0.5\left[\frac{e^{-0.5x}}{-0.5}\right]_0^2$$

$$= 1 + [e^{-1} - e^{0}]$$

$$= 1.06321$$

$$\boxed{P(A>2) = 0.3676}$$

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Question 7.

Solution 7.

(i) $f(3) = P(X \leq 3)$

$= P(X=1) + P(X=2) + P(X=3)$

$= 0.05 + 0.15 + 0.35$

$= \boxed{0.55}$

(ii) $E(X) = \sum_{i=1}^{5} x \cdot P(X=x)$

$= (1 \times 0.05) + (2 \times 0.15) + (3 \times 0.35) + (4 \times 0.4) + (0.05 \times 5)$

$= 0.05 + 0.3 + 1.05 + 1.6 + 0.25$

$E(X) = 3.25$

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Solution.

$p = 0.2$

$q = 0.8$

let A be the event probability that fewer the 3 of them exceed 1000

$$P(A) = {}^{15}(0 p^{0} q^{15}) + {}^{15}(p^{1} q^{14}) + {}^{15}(2p^{2} q^{13})$$

$$= 0.0352 + 0.1319 + 0.2308$$

$$P(A) = 0.3979$$

$$\boxed{P(A) \simeq \cdot 04}$$

Thus, the probability that fewer than 3 of them exceed 1000 is almost equal to 0.4

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Ques 9.

Solution 9.

$p = 0.01$
$q = 0.99$

$$P(x=3) = {}^{6}C_{2} p^{2} q^{4}$$

$$= \frac{6!}{2! \times 4!} \times (0.01)^{2} \times (0.99)^{4}$$

$$\boxed{P(x=3) = 0.00001441}$$

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