* Assignment *

Q1) 4, 7, 9, 9, 11, 15, 18, 18, 25, 18

$\Rightarrow$ i) mean $= \dfrac{\Sigma x}{n} = \dfrac{134}{10}$

$\bar{x} = 13.4$

ii) Median $= \left(\dfrac{n+1}{2}\right)^{th}$ term

$= \left(\dfrac{11}{2}\right)^{th}$ term

$= 5.5^{th}$ term

$\therefore$ Median $= 13$

or

$= \dfrac{11+15}{2}$

$= \dfrac{26}{2}$

$= 13$

iii) Mode :

As 18 Repeated 3 times.

Mode = 18.

iv) Standerd Deviation :

x_i	$(x_i - \bar{x})^2$
4	88.36
7	40.96
9	19.36
9	19.36
11	5.$\cancel{3}$76
15	2.56
18	21.16
18	21.16
18	21.16
25	134.56

$\Sigma (x_i - \bar{x})^2 = 374.4$

$\sigma^2 = \dfrac{374.4}{10}$

$\sigma^2 = 37.44$

$\sigma = \sqrt{37.44}$

$= 6.11882$

v) $Q_1 = \left(\frac{n}{4}\right)^{th}$ term $= 2.5^{th}$ term $= 8$

$Q_3 = \left(\frac{3n}{4}\right)^{th}$ term $= 7.5^{th}$ term $= 18$

$Q_2 = Q_3 - Q_1$
$= 18 - 8$
$= 10$

Q2)

x_i	f_i	CF	$f_i x_i$
0	5	5	0
1	11	16	11
2	26	42	42
3	15	57	45
4	3	60	12

$\Sigma f_i = 60$ $\Sigma f_i x_i = 120$

i) Mean $= \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{120}{60} = 2$

ii) Median $= \left(\frac{n+1}{2}\right)^{th} = \frac{61}{2}^{th} = 30.5^{th}$ term.

Median $= 2$

iii) Mode :- The Maximum Repetation are of 2

$\therefore$ Mode $= 2$

x_i	f_i	$(x_i - \bar{x})^2$	$f_i(x_i - \bar{x})^2$
0	5	4	20
1	11	1	11
2	26	0	0
3	15	1	15
4	3	4	12

$\Sigma f_i = 60$ $\qquad \Sigma f_i(x_i - \bar{x})^2 = 58$

$$\sigma^2 = \frac{58}{60} = 0.96667$$

iv) Standerd Deviation :

$$\sigma = \sqrt{0.96667} = 0.98319$$

v) $Q_1 = \left(\frac{n}{4}\right)^{th}$ term $= \left(\frac{60}{4}\right)^{th} = 15^{th}$ term

$\therefore Q_1 = 1$

$Q_3 = \left(\frac{3n}{4}\right)^{th}$ term $\left(\frac{180}{4}\right)^{th} = 45^{th}$ term

$Q_3 = 3$

Interquartile range $= Q_3 - Q_1$
$= 3 - 1$
$= 2$

Page No.:
Date:

Q4) Probability of choosing 2 members from the group

$P(A) = {}^{18}C_2$

P(Atleast one Female member) = 1 - P(both are male)

$P(F) = 1 - \frac{{}^{10}C_2}{{}^{18}C_2}$

$= 1 - \frac{45}{153} = \frac{138}{153}$

$= 0.70588235$

P(2 qualified females) $= \frac{{}^{7}C_2}{{}^{18}C_2}$

$= \frac{21}{153} = 0.137254902$

$P(Q/F) = \frac{P(F \cap Q)}{P(F)}$

$= \frac{0.137254902}{0.70588235} = 0.1944445$

$P(Q/F) = 0.1944445$

Q5)

Q5) $P(L_1) = 0.4$

$P(L_2) = 0.5$

$P(L_3) = 0.1$

P (Arriving late using Level 1) = 0.2

$P(L/L_2) = 0.4$

$P(L/L_3) = 0.1$

$$P(L_2/L) = \frac{P(L_2)\,P(L/L_2)}{P(L_1)\,P(L/L_1) + P(L_2)\,P(L/L_2) + P(L_3)\,P(L/L_3)}$$

$$= \frac{(0.5 \times 0.4)}{(0.4 \times 0.2) + (0.5 \times 0.4) + (0.1 \times 0.1)}$$

$$= \frac{0.2}{0.08 + 0.2 + 0.01} = \frac{0.2}{0.29}$$

$$= 0.6896551724$$

$\therefore$ $P(L_2/L) = 0.689655$

Q6) $X \sim U(1, 2)$

$$f_x x = \frac{1}{\beta - \alpha} = \frac{1}{2-1} = 1$$

$$y = \frac{3}{6-x}$$

$$y(6-x) = 3$$

$$6 - x = \frac{3}{y}$$

$$g^{-1}(y) = 6 - \frac{3}{y}$$

$$\frac{d}{dy} g^{-1}(y) = -3\left(\frac{-1}{y^2}\right)$$

$f_x\, g^{-1}(y) = 1$ { As R.V X can still only take b/w 0 and 1}

$$f_y(y) = f_x\, g^{-1}(y) \left| \frac{d}{dx} g^{-1}(y) \right|$$

$$= 1 \times \frac{3}{y^2} = 3y^{-2}$$

Q10 It will follow a possion distribution

$$\lambda = \frac{2}{5} = 0.4$$

$$P(X>2) = 1 - P(X<2)$$

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

$$= \frac{(0.4)^{0} e^{-0.4}}{0.1}$$

$$= e^{-0.4}$$

$$= 0.670320046$$

$$P(X=1) = \frac{(0.4)^{1} e^{-0.4}}{1!}$$

$$= 0.268128018$$

$$P(X=2) = \frac{(0.4)^{2} e^{-0.4}}{2!}$$

$$= 0.053625604$$

$$P(X \leq 2) = 0.992073668$$

$$P(X>2) = 1 - P(X \leq 2)$$

$$= 1 - 0.992073668$$

$$= 0.007926332$$

Q11) $p(b) = p(g)$

$p(b) + p(g) = 1$

$2(p(b)) = 1$

$p(b) = \frac{1}{2}$ $\quad$ $p(g) = \frac{1}{2}$

Let H Be the Event of having 3 boys.

$p(H) = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$

$p(H) = \frac{1}{8}$

Q12) AS Exp(10). If follows exponential distribution.

$\lambda = 10$

$\alpha = 1$

$t = 0.1$ days.

$$p(T < 0.1) = F(0.1)$$
$$= 1 - e^{-\lambda t}$$
$$= 1 - e^{-1}$$
$$= 0.632120559$$

Date:

Q13) $X \sim U(75, 120)$

$$f_x(x) = \frac{1}{120-75} = \frac{1}{45}$$

$$P(80 < X < 100) = \frac{100-80}{45} = \frac{20}{45}$$

$$P(80 < X < 100) = 0.44444$$

Q15) $$f(x) = \frac{k}{(x+5)^4}, \quad x > 0$$

i) $$\int_0^\infty f_x(x) = 1$$

$$k \int_0^\infty \frac{1}{(x+5)^4} \cdot dx = 1$$

let $(x+5) = t$

$dx = dt$

$$k \int_5^\infty t^{-4} \, dt = 1$$

$$k \left[\frac{t^{-3}}{-3} \right]_5^\infty = 1$$

$$k \left[\frac{-1}{3t^3} \right]_5^\infty = 1$$

$$k\left[0-\left(\frac{-1}{3(125)}\right)\right]=1$$

$$\frac{k}{375}=1$$

$$K=375$$

ii) $F(10) = p(X \leq 10)$

$$=\int_0^{10}\frac{k}{(x+5)^4}$$

$$=375\int_0^{10}\frac{1}{(x+5)^4}$$

let $(x+5)=t$

$dx = dt$

$$=375\int_5^{15} t^{(-4)}$$

$$=375\left[\frac{-1}{3t^3}\right]_5^{15}$$

$$=375\left[\frac{1}{3t^3}\right]_{15}^{5}$$

$$=375\left[\frac{1}{375}-\frac{1}{10125}\right]$$

$$=1-\frac{375}{10125}$$

$$=0.963$$

Date:

iii) $E(X) = \int_0^\infty x \cdot f_X(x)\, dx$

$= \int_0^\infty \frac{xK}{(x+5)^4}$

$= 375 \int_0^\infty \frac{x}{(x+5)^4}$

let, $(x+5) = t$

$dx = dt$

$= 375 \int_5^\infty \frac{t-5}{t^4}$

$= 375 \int_5^\infty \frac{1}{t^3} - \frac{5}{t^4}$

$= 375 \left[\frac{-1}{2t^2} + \frac{5}{3t^3} \right]_5^\infty$

$= 375 \left[\frac{5}{3t^3} - \frac{1}{2t^2} \right]_5^\infty$

$= 375 \left[0 - 0 - \frac{5}{375} + \frac{1}{50} \right]$

$= 375 \left[\frac{1}{50} - \frac{5}{375} \right]$

$= \frac{375}{50} - 5 = 7.5 - 5$

$E(X) = 2.5$