Probability And Statistics
Assignment - 1

Q1] i) 4, 7, 9, 9, 11, 15, 18, 18, ~~25~~ 18, 25

$n = 10$

$\Rightarrow$ Mean $= \frac{\Sigma x}{n} = \frac{134}{10} = 13.4$

$\Rightarrow$ Median $= \left(\frac{n+1}{2}\right)^{th}$ term $= 5.5$ th term

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

$= 13$

$\Rightarrow$ Mode $= 18$

$\Rightarrow$ Standard deviation $= \sqrt{\frac{\Sigma(x_i - \bar{x})^2}{n}}$

x_i	$(x_i - \bar{x})^2$
4	88.36
7	40.96
9	19.36
9	~~5.76~~ 19.36
11	~~2.56~~ 5.76
15	~~21.16~~ 2.56
18	21.16
18	21.16
18	21.16
25	134.56

$\sigma^2 = \frac{374.4}{10} = 37.44$

$\sigma = \sqrt{37.44} = 6.12.$

$\Rightarrow$ Last term of Q1 is the $\left(\frac{n}{4}\right)^{th}$ term $= 2.5$th term

Q10] It will follow a poisson distribution.

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

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

$$P(X=0) = \frac{\lambda^x \cdot e^{-\lambda}}{x!} = \frac{(0.4)^0 e^{-0.4}}{01}$$

$$= e^{-0.4} = 0.6703$$

$$P(X=1) = \frac{(0.4)^1 e^{-0.4}}{11}$$

$$= 0.2681$$

$$P(X=2) = \frac{(0.4)^2 e^{-0.4}}{21} = 0.0536$$

$$P(X \leq 2) = 0.9920$$

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

$$= 0.0079$$

Q11) $P(W) = P(G)$

$$P(W) + P(G) = 1$$

$$2P(W) = 1$$

$$P(W) = \frac{1}{2}$$

$$P(G) = \frac{1}{2}$$

E = having 3 boys

$$P(E) = \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$$

$$P(E) = \frac{1}{8}$$

Last term of $Q_1 = \frac{7+9}{2} = 8$

Last term of Q_3 is the $\left(\frac{3n}{4}\right)^{th}$ term $= 7.5^{th}$

Last term of $Q_3 = \frac{18+18}{2}$

$= 18$

Inter-Quatile Range $= Q_3 - Q_1$

$= 18 - 8$

$= \boxed{10}$

ii)

x_i	f_i	ct
0	5	5
1	11	16
2	26	42
3	15	57
4	3	60

$n = 60$

$\text{mean} = \frac{\Sigma f_i x_i}{n}$

$= \frac{120}{60}$

$= \boxed{2}$

$\text{median} = \left(\frac{n+1}{2}\right)^{th}$ term $= (30.5)^{th}$ term

$\text{median} = 2$

$\text{mode} = \boxed{2}$

Q12) It is following exponential dist as Exp(10)

Ans $\lambda = 10$

$\alpha = 1$

$t = 0.1$ days

$P(T < 0.1) < F(0.1)$

$= 1 - e^{-\lambda t}$

$= 1 - e^{-1}$

$= 0.6321$

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

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

$= \frac{1}{45}$

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

$= \frac{20}{45}$

$= 0.444$

Q4]

⇒ P(Choosing 2 members from the group) = ${}^{18}C_2$ = P(A)

P(atleast one female) = 1 − P(both are male)

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

$$= 0.70588$$

$$P(2 \text{ Qualified Females}) = \frac{{}^{7}C_2}{{}^{18}C_2}$$

$$P(F \cap Q) = 0.13725$$

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

$$= \frac{0.13725}{0.70588}$$

$$= 0.1944.$$

Q5]

⇒ P(Delivering via level 1) = P(L1) = 0.4

P(L2) = 0.5

P(L3) = 0.1

P(Arriving late using level 1) = P(L) = 0.2

P(L|L1) = 0.4

P(L|L3) = 0.1

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

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

$$= \frac{0.16}{0.08 + 0.16 + 0.01}$$

$$= \frac{0.16}{0.25}$$

$$= \boxed{0.64}$$
