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Subject :- Bio statistic

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(3) Question No 3: Part A

Ans:-

Rain fall	no. of year $f$	mid Pt value $x$	$\sum fx$	$f/x$	$\log(x)$	$f \log(x)$	$x - \bar{x}$	$(x - \bar{x})^2$	$f(x - \bar{x})^2$
20-24	1	22	22	0.046	1.34	1.34	-14.8	219.04	219.04
25-29	3	27	81	0.12	1.43	4.29	-9.8	96.04	288.12
30-34	5	32	160	0.15	1.50	7.5	-7.8	60.84	304.2
35-39	8	37	296	0.21	1.56	12.48	-0.2	0.04	0.32
40-44	5	42	210	0.11	1.62	8.1	5.2	27.04	135.2
45-49	2	47	94	0.04	1.67	3.34	10.2	104.04	208.04
50-54	0	52	0	0	1.71	0	15.2	231.04	0
55-59	1	57	57	0.017	1.75	1.75	20.2	408.04	408.04
Total	25		920	0.693	38.8				1373.96

Rain fall	(2) No of years	$f(x - \bar{x})$	CLASS boundaries C.L	Cumulative Frequency C.F
20-24	1	14.8	19.5-24.5	1
25-29	3	29.4	24.5-29.5	4
30-34	5	24	29.5-34.5	9
35-39	8	1.6	34.5-39.5	17
40-44	5	26	39.5-44.5	22
45-49	2	204	44.5-49.5	24
50-54	0	0	49.5-54.5	24
55-59	1	20.2	54.5-59.5	25

$$1) A.M = \frac{\sum_{i=1}^n f_i x_i}{\sum_{i=1}^n f_i} = \frac{920}{25} \Rightarrow A.M = 36.80$$

$$2) H.M = \frac{1/f_i}{1/(f_i/x_i)} = \frac{25}{0.693} \Rightarrow H.M = 36.08$$

$$3) G.M = \text{Antilog} \left[ \frac{\sum_{i=1}^n f_i \log(x_i)}{\sum_{i=1}^n f_i} \right]$$

$$= \text{Antilog} \left[ \frac{38.8}{25} \right]$$

$$= \text{Antilog} (1.55) \Rightarrow G.M = 35.48$$

4) Median =  $\left(\frac{n}{2}\right)^{\text{th}} = \left(\frac{25}{2}\right)^{\text{th}} = (12.5)^{\text{th}}$  which is lie between in the class 34.5-39.5. there fore

$$\text{Median} = l + \frac{h}{f} \left(\frac{n}{2} - c.f\right) = 34.5 + \frac{5}{8} (12.5 - 9) = 34.5 + \frac{5}{8} (3.5) = 34.5 + 2.19$$

$$\text{So Median} = 36.69$$



5) Range = Height class upper boundaries  
 Range = Lowest class lower boundaries  
 Range = 59.5 - 19.5  
Range = 40

6) Mode  $l + \frac{z_n - z_1}{(z_n - z_1) + (z_n - z_2)} \times h$   
 $l$  = lower class boundaries of the modal class  
 $z_n$  = frequency of the modal class  
 $z_1$  = Associated with the class following the modal class  
 $h$  = width of class interval  
 so the mode, can be  
 mode =  $34.5 + \frac{(8-5)}{(8-5) + (8-5)} \times 5$   
 $= 34.5 + \frac{3}{3+3} \times 5$   
 $= \text{Mode} = 37$

7) Quartiles The three value which divide the distribution into four equal parts are called the quartiles. These value are denoted by  $Q_1, Q_2$  and  $Q_3$ .  $Q_1$  is called the lower quartile and  $Q_3$  are called upper quartile.  $Q_2$  is called Median.

So, we shall calculate,  $Q_1$  and  $Q_3$

$Q_1 = (\frac{n}{4})^{th} = (\frac{25}{4})^{th} = (6.25)^{th}$ , which associated in the class (29.5 - 34.5). Therefore

$Q_1 = l + \frac{h}{8} (\frac{n}{4} - C.f) = 29.5 + \frac{5}{8} (6.25 - 4) = 29.5 + 2.25$   
 $Q_1 = 31.75$

$Q_3 = (\frac{3n}{4})^{th} = (\frac{3 \times 25}{4})^{th} = (18.75)^{th}$ , which corresponds in the class, (39.5 - 44.5) therefore

$Q_3 = l + \frac{h}{8} (\frac{3n}{4} - C.f) = 39.5 + \frac{5}{8} (18.75 - 17) = 39.5 + 1.75$   
 $Q_3 = 41.25$

8) Deciles which divide the distribution into ten equal parts, are called deciles. which denoted by  $D_1, D_2, \dots, D_9$ . The calculation of each decile to be calculated is too large and time consuming. So for the practice we can calculate

$D_2 = (\frac{2n}{10})^{th} = (\frac{2 \times 25}{10})^{th} = 5^{th}$  which corresponds in the class (29.5 - 34.5) therefore

$D_2 = l + \frac{h}{8} (\frac{2n}{10} - C.f) = 29.5 + \frac{5}{8} (5 - 4) = 29.5 + 1$   
 $D_2 = 30.5$



Decentiler which is divide the distribution into hundred equal parts are called percentile, which is denoted by  $P_1, P_2, P_3, \dots, P_{100}$

As  $P_{91} = \left(\frac{30 \times 25}{100}\right)^{th} = (7.5)^{th}$  which associated in the class  $(29.5 - 34.5) \cdot 50$

$P_{30} = 1 - \frac{1}{5} \left(\frac{300 - 280}{100}\right) = 29.5 + \frac{5}{5} (7.5 - 4) = 29.5 + 3.50$

⑩  $M.O = \frac{\sum_{i=1}^n f_i (x_i - \bar{x})}{\sum_{i=1}^n f_i} = \frac{136.4}{25} \quad [M.O = 5.46]$

⑪ Variance =  $\frac{\sum_{i=1}^n f_i (x_i - \bar{x})^2}{\sum_{i=1}^n f_i} = \frac{1373.96}{25} = [Variance = 54.96]$

⑫ Standard Deviation =  $\sqrt{Variance} = \sqrt{54.96} \quad [S.D = 7.41]$

⑬ Coefficient of variation (C.V) =  $\frac{S.D}{\bar{x}} \times 100$   
 $= \frac{7.41}{36.80} \times 100 \quad [C.V = 20.14]$

⑭ Quartile deviation (Q.D) =  $Q_3 - Q_1$

where  $Q_3 = 41.25$  and  $Q_1 = 31.75$   $Q.D = \frac{41.25 - 31.75}{2} \quad [Q.D = 4.75]$

⑮ Skewness (SK) =  $\frac{Mean - Mode}{S.D}$  where, Mean = 36.80, Mode = 37  
 and  $S.D = 7.41$   $SK = \frac{36.80 - 37}{7.41} = \frac{-0.20}{7.41} = [Skewness = -0.03]$

$x$	$1/x$	$\log(x)$	$(x - \bar{x})$	$(x - \bar{x})^2$	$ x - \bar{x} $
22	0.045	1.34	-14.8	219.04	14.8
27	0.037	1.4313	-9.8	96.04	9.8
27	0.037	1.4313	-9.8	96.04	9.8
27	0.037	1.4313	-9.8	96.04	9.8
32	0.0312	1.5051	-4.8	23.04	4.8
32	0.0312	1.5051	-4.8	23.04	4.8
32	0.0312	1.5051	-4.8	23.04	4.8
32	0.0312	1.5051	-4.8	23.04	4.8
32	0.0312	1.5051	-4.8	23.04	4.8
32	0.0312	1.5051	-4.8	23.04	4.8
37	0.027	1.5682	0.2	0.04	0.2
37	0.027	1.5682	0.2	0.04	0.2
37	0.027	1.5682	0.2	0.04	0.2
37	0.027	1.5682	0.2	0.04	0.2
37	0.027	1.5682	0.2	0.04	0.2
37	0.027	1.5682	0.2	0.04	0.2
37	0.027	1.5682	0.2	0.04	0.2
37	0.027	1.5682	0.2	0.04	0.2
42	0.0238	1.6232	5.2	27.04	5.2
42	0.0238	1.6232	5.2	27.04	5.2
42	0.0238	1.6232	5.2	27.04	5.2
42	0.0238	1.6232	5.2	27.04	5.2
42	0.0238	1.6232	5.2	27.04	5.2
42	0.0212	1.6720	1.76	3.10	1.76
42	0.0212	1.6720	1.76	3.10	1.76
57	0.0175	1.7558	20.2	408.04	20.2
Total	0.73	38.92		1172.12	136.40



Qant B

$$1) AM = \frac{\sum_{i=1}^n x_i}{n} = \frac{920}{25} \quad \boxed{AM = 36.8}$$

$$2) HM = \frac{n}{\sum_{i=1}^n (1/x_i)} = \frac{25}{0.73} = \boxed{HM = 34.25}$$

$$3) GM = \text{Antilog} \left[ \frac{\sum_{i=1}^n \log(x_i)}{n} \right] = \text{Antilog} \left[ \frac{38.92}{25} \right] = \text{Anti-log}(1.56)$$

$$\boxed{GM = 36.04}$$

4) Mode = Most repeated value is called Mode  
So,  $\boxed{\text{Mode} = 37}$

5) Median = is the mid-value of a data set  
Median =  $\left[ \left( \frac{n}{2} \right) + 1 \right]^{\text{th}} = \left[ \left( \frac{25}{2} \right) + 1 \right]^{\text{th}} = (12+1)^{\text{th}}$   
Median = 13<sup>th</sup>, Integer of a data set  $\text{Median} = 37$

6) Quartiles  
 $Q_1 = \left[ \left( \frac{n}{4} \right) + 1 \right]^{\text{th}} = \left[ \left( \frac{25}{4} \right) + 1 \right]^{\text{th}} = (6.25+1)^{\text{th}} = (7.25)^{\text{th}} = 7^{\text{th}}$   
 $Q_3 = \left[ \left( \frac{3n}{4} \right) + 1 \right]^{\text{th}} = \left[ \left( \frac{3 \times 25}{4} \right) + 1 \right]^{\text{th}} = (19.75)^{\text{th}} = 20^{\text{th}}$ , Integer  $\boxed{Q_3 = 42}$

7) Deciles  
As,  $D_6 = \left[ \left( \frac{2n}{10} \right) + 1 \right]^{\text{th}} = \left[ \left( \frac{2 \times 25}{10} \right) + 1 \right]^{\text{th}} = (5+1)^{\text{th}} = 6^{\text{th}}$ , Integer  
 $\boxed{D_6 = 32}$

8) Percentiles  
As  $P_{30} = \left[ \left( \frac{30n}{100} \right) + 1 \right]^{\text{th}}$   
 $= \left[ \left( \frac{30 \times 25}{100} \right) + 1 \right]^{\text{th}}$   
 $= (7.50+1)^{\text{th}} = (8.50)^{\text{th}}$   
 $P_{30} = 9^{\text{th}}$ , Integer  $\boxed{P_{30} = 32}$

9) Range = Largest value - smallest value  
Range =  $55 - 22$   $\boxed{R = 33}$

$$10) Q.D = \frac{Q_3 - Q_1}{2} = \frac{42 - 32}{2} \quad \boxed{Q.D = 5}$$

$$1) \text{Skewness} = \frac{3 \text{ Mean} - \text{Mode}}{S.D} = \frac{3 \times 36.8 - 37}{7.41} = \frac{-0.20}{7.41} \quad \boxed{\text{Skewness} = -0.03}$$

2) Coefficient of variation (C.V)  
 $C.V = \frac{S.D}{\text{Mean}} \times 100 = \frac{7.41}{36.8} \times 100 \quad \boxed{C.V = 20.14}$

$$3) \text{Mean Deviation} = \frac{\sum_{i=1}^n |x_i - \bar{x}|}{n} = \frac{136.40}{25} \quad \boxed{M.D = 5.46}$$

$$4) \text{Variance} = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n} = \frac{1172.12}{25} = \boxed{\text{Variance} = 46.88}$$

$$5) S.D = \sqrt{\text{Variance}}$$

$$= \sqrt{46.88}$$

$$\boxed{S.D = 6.85}$$



Question No 2

Ans - Part (a)

The purpose of census is to count the entire population of a country and individuals at location where they actually live. Census counts the number, of living in the home, their age, Sex and race. It helps in the forming and important base for planning policy development and decreasing numbering.

Part (b) In census each and every unit of the population is studied in the sampling. The census refer to periodic collection of information about the population from the this more suitable to use census method if the population compare to sample survey. Census survey takes more time however it is margin for error in sample survey while census survey is more correct.

Part (c)

Obviously not having a full response rate to the census is problem for the accuracy of census as insufficient data will be collected to know about population and of following base for planning and policy development.

Part (d)

Ironic Response to the census by the public signify there into bad attitude to the survey and there carelessness in following accurate data. Questions of these types are invalidated with such abuse response.

Part (e)

By using the information of given table it is true that men needs more food to maintain its energy level.

Part (f)

Census, it self mean the study of every object under the observation. And in real it is such a difficult task to perform. Also it is quit difficult to government to go to lot of things that have been done by these agencies not only to of an error may increase error further.



Q No 1

Ans Part (A) for men over all men consumption of fresh vegetable

$$\text{Mean} = \frac{204 + 459 + 266 + 217}{4} = 236.5$$

⇒ Mean of Fruits

$$\text{mean} = \frac{31 + 45 + 69 + 105}{4} = \boxed{62.5}$$

→ Mean of Rice

$$\bar{x} = \frac{(367 + 337 + 269 + 246)}{4} = \boxed{304.75}$$

⇒ Mean of Fish

$$\bar{x} = \frac{23 + 28 + 31 + 44}{4} = \boxed{31.5}$$

⇒ for women

$$\text{Mean of fresh vegetables}$$

$$\bar{x} = \frac{178 + 235 + 266 + 304}{4} = \boxed{753}$$

$$\Rightarrow \text{Mean of Fruits } \bar{x} = \frac{28 + 46 + 70 + 121}{4} = \boxed{66.25}$$

$$\Rightarrow \text{Mean of Rice } \bar{x} = \frac{315 + 276 + 243 + 220}{4} = \boxed{263.5}$$

$$\Rightarrow \text{Mean of Meat } \bar{x} = \frac{48 + 43 + 54 + 63}{4} = \boxed{52}$$

$$\Rightarrow \text{Mean of Fish } \bar{x} = \frac{14 + 21 + 28 + 46}{4} = 28.5$$

Combined Mean

Combined Mean for Men

C.M of Fresh vegetables

$$\bar{x}_{\text{comb}} = \frac{\bar{x}_1 n_1 + \bar{x}_2 n_2 + \bar{x}_3 n_3}{n_1 + n_2 + n_3}$$

$$= \frac{(236.5)(204) + (236.5)(259) + (236.5)(266) + (236.5)(47)}{204 + 259 + 266 + 217} = \boxed{236.5}$$

C.M of Rice

$$\bar{x}_c = \frac{(367)(304.75) + 337(304.75) + (269)(304.75) + (246)(304.75)}{367 + 337 + 269 + 246} = 371.25$$

C.M of Fish

$$\bar{x}_c = \frac{(23)(31.5) + (31)(31.5) + (31)(31.5) + (44)(31.5)}{23 + 31 + 31 + 44} = \boxed{\bar{x}_c = 31.5}$$



C.M of Meat

$$\bar{x}_C = \frac{(69.25)(70) + (69.25)(62) + (69.25)(69) + (69.25)(70)}{70 + 61 + 69 + 70}$$

$$\bar{x}_C = \boxed{69.25}$$

C.M of Woman

$$\bar{x}_C = \frac{(245.75)(178) + (245.75)(235) + (245.75)(269) + (245.75)(304)}{178 + 235 + 266 + 304}$$

$$\bar{x}_C = \boxed{245.75}$$

C.M of meat

$$\bar{x}_C = \frac{(52)(48) + (52)(43) + (52)(54) + (52)(63)}{48 + 43 + 54 + 63}$$

$$\bar{x}_C = \boxed{52}$$

Combined mean of fish

$$\bar{x}_C = \frac{(28.5)(19) + (28.5)(21) + (28.5)(28) + (28.5)(46)}{19 + 21 + 28 + 46}$$

$$\bar{x}_C = \boxed{28.5}$$

C.M of Rice

$$\bar{x}_C = \frac{(263.5)(315) + (263.5)(276) + (263.5)(243) + (263.5)(220)}{315 + 276 + 243 + 220}$$

$$\bar{x}_C = \boxed{263.5}$$



## Q no 1 Part B)

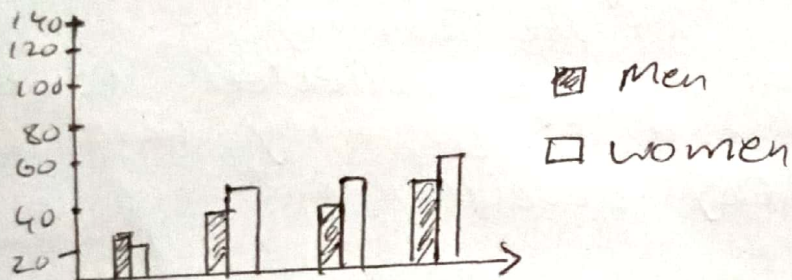
Ans Milk, root vegetable and wheat flour are very low for both men and women in Q<sub>4</sub> and Q<sub>3</sub> but it rises high in Q<sub>2</sub> and Q<sub>1</sub>, so these who eat most vegetable and wheat flour then those who eat less fresh vegetable.

## Part C

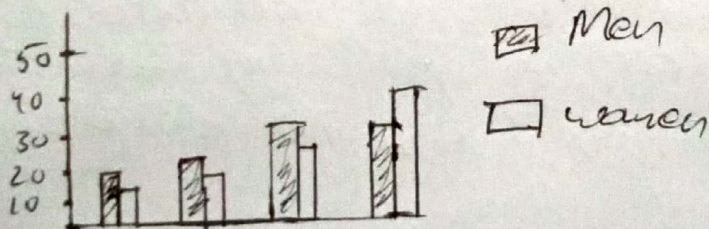
In fruit and fish the value of mean increasing from Q<sub>4</sub> to Q<sub>1</sub> in men and women. but in Rice the value of mean decreasing from Q<sub>4</sub> to Q<sub>3</sub>.

## Part D) Diagrams

For fruits:



For fish



## Part F

Standard deviation =  $S.E \times \sqrt{n}$  by using above formula the value of standard deviation of men is more than women wheat flour vegetable, fruit, wheat flour whole grain.