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APPENDIX-1

Statistical calculation

A. Calculation of mean, standard deviation & coefficient of variation

Sales budget in Rupees ('000)

For HSTP							
FY	Budgeted (X)	Actual (Y)	$(X-\bar{X})$	$(Y-\bar{Y})$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$	$(X-\bar{X})(Y-\bar{Y})$
2061/062	19670.85	18550.74	2611.03	2411.84	6817477.66	5817469.03	6297655.53
2062/063	18975.78	18547.43	1915.96	2408.633	3670914.22	5801512.93	4614851.71
2063/064	15836.37	14760.49	-1223.45	-1378.31	1496829.9	1899730.186	1686289.67
2064/065	14877.36	12243	-2182.46	-3895.8	4763118.56	15177234.27	8502409.43
2065/066	15938.1	16592.32	-1121.08	-453.53	1256831.56	205685.83	-508441.2
Total	85298.46	80693.98	0.001	-0.002	18005171.92	28901632.25	20592765.15

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Let X and Y be the budgeted sales and actual sales respectively

For Budgeted sales

$$\text{Mean } (\bar{X}) = \frac{\sum X}{N} = \frac{85299.10}{5} = 17059.82$$

$$\text{S.D. } (\pm) = \sqrt{\frac{\sum (X-\bar{x})^2}{N}} = \sqrt{\frac{18005171.92}{5}} = 1897.64$$

$$C.V = \frac{\pm}{x} \times 100\% = \frac{1897.64}{17059.82} \times 100\% = 11.12$$

For Actual Sales

$$\text{Mean } (\bar{Y}) = \frac{\sum Y}{N} = \frac{80693.98}{5} = 16138.80$$

$$\text{S.D. } (\pm) = \sqrt{\frac{\sum (X-\bar{x})^2}{N}} = \sqrt{\frac{28901632.25}{5}} = 2404.23$$

$$C.V = \frac{\pm}{x} \times 100\% = \frac{2404.23}{16138.80} \times 100\% = 14.90$$

Sales budget in Rupees ('000)

For SHPTI

FY	Budgeted (X)	Actual (Y)	$(X-\bar{X})$	$(Y-\bar{Y})$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$	$(X-\bar{X})(Y-\bar{Y})$
2061/062	7543.59	6776.99	-1547.801	-1899.79	2395687.94	3609209.64	2940499.96
2062/063	10753.83	11170.38	1662.44	2493.59	2763693.45	6218011.04	4145440.43
2063/064	7525.85	6135.98	-1565.54	-2540.81	2450928.02	6455700.21	3977745.15
2064/065	9589.371	9496.96	497.94	820.17	247947.33	672683.75	408399.40
2065/066	10044.32	9803.61	952.93	1126.83	908077.49	1269745.85	1073791.24
Total	45456.96	43383.91	-0.035	-0.04	8766334.23	18225350.49	12545876.19

Let X and Y be the budgeted sales and actual sales respectively

For Budgeted sales

$$\text{Mean } (\bar{X}) = \frac{\sum X}{N} = \frac{45456.97}{5} = 9091.39$$

$$\text{S.D. } (\pm) = \sqrt{\frac{\sum (X-\bar{x})^2}{N}} = \sqrt{\frac{8766334.23}{5}} = 1324.11$$

$$C.V = \frac{\pm}{x} \times 100\% \quad \frac{1324.11}{9091.39} \times 100\% = 11.12$$

For Actual Sales

$$\text{Mean } (\bar{Y}) = \frac{\sum Y}{N} = \frac{43383.91}{5} = 14.56$$

$$\text{S.D. } (\pm) = \sqrt{\frac{\sum (X-\bar{x})^2}{N}} = \sqrt{\frac{18225350.49}{5}} = 1909.21$$

$$C.V = \frac{\pm}{x} \times 100\% = \frac{1909.21}{8676.78} \times 100\% = 22.004$$

B. Calculation of combined SD & T-test

FY	HSTP			SHPTI		
	Actual (x)	$(X-\bar{X})$	$(Y-\bar{Y})$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$	$(X-\bar{X})(Y-\bar{Y})$
2061/062	18550.74	2411.84	5817469.03	6776.99	-1899.79	3609209.64

2062/063	18547.43	2408.633	5801512.93	11170.38	2493.59	6218011.04
2063/064	14760.49	-1378.31	1899730.186	6135.98	-2540.81	6455700.21
2064/065	12243	-3895.8	15177234.27	9496.96	820.17	672683.75
2065/066	16592.32	-453.53	205685.83	9803.61	1126.83	1269745.85
Total	80693.98	-0.002	28901632.25	43383.91	-0.04	18225350.49

A.M. $(\overline{X_1})$ $= \frac{\sum X}{N_1} = \frac{80693.98}{5} = 16138.80$

A. M. $(\overline{Y}_1) = \frac{\sum Y}{N_2} = \frac{43383.91}{5} = 8676.78$

$$S = \sqrt{\frac{\sum (X-\overline{X})^2 + \sum (Y-\overline{Y})^2}{N_1 + N_2 - 2}} = \sqrt{\frac{28901632.25 + 18225350.49}{5+5-2}} = 2427.11$$

$$|t| = \frac{\overline{X} - \overline{Y}}{S\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} = \frac{16138.80 - 8676.78}{2427.11\sqrt{\frac{1}{5} + \frac{1}{5}}} = 4.86$$

C. Calculation of Karl person's coefficient correlation and probable error of coefficient of correlation.

For HSTP

Correlation coefficient $r_{xy} = \frac{\sum (X-\overline{X})(Y-\overline{Y})}{\sqrt{\sum (X-\overline{X})^2}\sqrt{\sum (Y-\overline{Y})^2}}$

$$= \frac{20592765.15}{\sqrt{18005171.92}\sqrt{28901632.25}} = 0.903$$

Probability Error $P.E(r) = 0.6745 \times \frac{1-r^2}{\sqrt{n}}$ = $P.E(r) = 0.6745 \times \frac{1-0.903^2}{\sqrt{5}}$ = 0.0557

For SHPTI

Correlation coefficient $r_{xy} = \frac{\sum(X-\overline{X})(Y-\overline{Y})}{\sqrt{\sum(X-\overline{X})^2}\sqrt{\sum(Y-\overline{Y})^2}}$

$$= \frac{12545876.19}{\sqrt{8766334.228}\sqrt{18225350.49}} = 0.992$$

Probability Error $P.E(r) = 0.6745 \times \frac{1-r^2}{\sqrt{n}}$

$$= P.E(r) = 0.6745 \times \frac{1-0.992^2}{\sqrt{5}} = 0.0048$$

D. Calculation of least square trend for HSTP

FY	Actual sales(Y)	X	X^2	XY
2061/062	18550.74	-2	4	-37101.48
2062/063	18547.43	-1	1	-18547.43
2063/064	14760.49	0	0	0
2064/065	12243	1	1	12243
2065/066	16592.32	2	4	33184.65
Total	80693.98	0	10	-10221.26

Y = a + bX

Then

$\sum Y = na + b\sum X$

$\sum XY = a\sum X + b\sum X^2$

i.e.

80693.98 = 5a + 0b

-10221.26 = 0a +10b

By solving

a = 16138.80

b = -1022.13

Therefore, Y = 16138.80 -1022.13X

E. Calculation of least square trend for SHTPI

FY	Actual sales(Y)	X	X^2	XY
2061/062	6776.99	-2	4	-13553.98
2062/063	11170.38	-1	1	-11170.38
2063/064	6135.98	0	0	0
2064/065	9496.96	1	1	9496.96
2065/066	9803.61	2	4	19607.23
Total	43383.91	0	10	4379.86

Y = a + bX

Then

$\sum Y = na + b\sum X$

$\sum XY = a\sum X + b\sum X^2$

i.e.

43383.91 = 5a + 0b

4379.86 = 0a +10b

By solving

a = 8676.72

b = 437.98

Therefore, Y = 8676.72 +437.98X

APPENDIX-2

Statistical calculation

Sales unit

A. Calculation of Mean, s.d., coefficient of variation

Sales unit in ('000)

kg

For HSTP							
FY	Budgeted (X)	Actual (Y)	$(X-\overline{X})$	$(Y-\overline{Y})$	$(X-\overline{X})^2$	$(Y-\overline{Y})^2$	$(X-\overline{X})(Y-\overline{Y})$
2061/062	130	118.92	38	24.51	1444	600.59	931.27
2062/063	100	115.44	8	21.03	64	442.14	168.22
2063/064	80	76.09	-12	-18.32	144	335.73	219.88
2064/065	80	72.88	-12	-21.53	144	463.67	258.4
2065/066	70	88.73	-22	-5.68	484	32.25	124.94
Total	460	472.04	0	0	2280	1874.38	1702.69

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Let X and Y be the budgeted sales unit and actual sales unit respectively

For Budgeted sales

Mean ($\bar{X}$) = $\frac{\sum X}{N} = \frac{460}{5} = 92$

S.D. (±) = $\sqrt{\frac{\sum (X-\bar{x})^2}{N}} = \sqrt{\frac{2280}{5}} = 21.21$

$C.V = \frac{\pm}{x} \times 100\% = \frac{21.35}{92} \times 100\% = 23.21\%$

For Actual Sales

Mean ($\bar{Y}$) = $\frac{\sum Y}{N} = \frac{472.4}{5} = 94.41$

S.D. (±) = $\sqrt{\frac{\sum (X-\bar{x})^2}{N}} = \sqrt{\frac{1874.38}{5}} = 19.36$

$C.V = \frac{\pm}{x} \times 100\% = \frac{19.36}{94.41} \times 100\% = 20.51\%$

Sales unit in ('000) kg

For SHTPI							
FY	Budgeted (X)	Actual (Y)	$(X-\bar{X})$	$(Y-\bar{Y})$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$	$(X-\bar{X})(Y-\bar{Y})$
2061/062	70	58.34	11	1.59	121	2.52	17.47
2062/063	70	70.4	11	13.65	121	186.27	150.13
2063/064	35	46.55	-24	-10.2	576	104.08	244.848
2064/065	64	55.57	5	-1.18	25	1.4	-5.91
2065/066	56	52.9	-3	-3.85	9	14.82	11.55
Total	295	283.75	0	0	852	309.09	423.99

Let X and Y be the budgeted sales unit and actual sales unit respectively

For Budgeted sales

Mean ($\bar{X}$) = $\frac{\sum X}{N} = \frac{295}{5} = 59$

S.D. (±) = $\sqrt{\frac{\sum (X-\bar{x})^2}{N}} = \sqrt{\frac{852}{5}} = 13.05$

$$C.V = \frac{\pm}{\bar{x}} \times 100\% = \frac{13.05}{59} \times 100\% = 22.13\%$$

For Actual Sales

$$\text{Mean } (\bar{Y}) = \frac{\sum Y}{N} = \frac{283.75}{5} = 56.75$$

$$\text{S.D. } (\pm) = \sqrt{\frac{\sum (X - \bar{x})^2}{N}} = \sqrt{\frac{309.09}{5}} = 7.86$$

$$C.V = \frac{\pm}{\bar{x}} \times 100\% = \frac{7.862}{56.75} \times 100\% = 13.85\%$$

B. Calculation of combine SD. and t-test:

FY	HSTP			SHTPI		
	Actual(X)	$(X - \bar{X})$	$(X - \bar{X})^2$	Actual (Y)	$(Y - \bar{Y})$	$(Y - \bar{Y})^2$
2061/062	118.92	24.51	600.59	58.34	1.59	2.52
2062/063	115.44	21.03	442.14	70.4	13.65	186.27
2063/064	76.09	-18.32	335.73	46.55	-10.2	104.08
2064/065	72.88	-21.53	463.67	55.57	-1.18	1.4
2065/066	88.73	-5.68	32.25	52.9	-3.85	14.82
Total	472.04	0	1874.38		0	309.09

$$\text{A.M. } (\bar{X}_1) = \frac{\sum X}{N_1} = \frac{472}{5} = 94.41$$

$$\text{A. M. } (\bar{Y}_1) = \frac{\sum Y}{N_2} = \frac{283.75}{5} = 56.75$$

$$S = \sqrt{\frac{\sum (X - \bar{X})^2 + \sum (Y - \bar{Y})^2}{N_1 + N_2 - 2}} = \sqrt{\frac{1874.38 + 309.09}{5 + 5 - 2}} = 16.52$$

$$|t| = \frac{\overline{X} - \overline{Y}}{S\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} = \frac{94.41 - 56.75}{16.52\sqrt{\frac{1}{5} + \frac{1}{5}}} = 3.604\%$$

C. Calculation of Karl person's coefficient correlation and probable error of coefficient of correlation.

For HSTP

Correlation coefficient $r_{xy} = \frac{\sum (X - \overline{X})(Y - \overline{Y})}{\sqrt{\sum (X - \overline{X})^2}\sqrt{\sum (Y - \overline{Y})^2}}$

$= \frac{1702.69}{\sqrt{2280}\sqrt{1874.38}} = 0.824$

Probability Error $P.E(r) = 0.6745 \times \frac{1 - r^2}{\sqrt{n}}$

$= P.E(r) = 0.6745 \times \frac{1 - 0.824^2}{\sqrt{5}} = 0.09683$

For SHTPI

Correlation coefficient $r_{xy} = \frac{\sum (X - \overline{X})(Y - \overline{Y})}{\sqrt{\sum (X - \overline{X})^2}\sqrt{\sum (Y - \overline{Y})^2}}$

$= \frac{423.99}{\sqrt{852}\sqrt{309.09}} = 0.826$

Probability Error $P.E(r) = 0.6745 \times \frac{1 - r^2}{\sqrt{n}}$

$= P.E(r) = 0.6745 \times \frac{1 - 0.826^2}{\sqrt{5}} = 0.0957$

D. Calculation of Least Square Trend for HSTP

FY	Actual sales(Y)	X	X^2	XY
2061/062	118.92	-2	4	-237.83
2062/063	115.44	-1	1	-115.44
2063/064	76.09	0	0	0
2064/065	72.88	1	1	72.88
2065/066	88.73	2	4	177.46
Total	472.04	0	10	-102.93

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$Y = a + bX$

Then

$\sum Y = na + b\sum X$

$\sum XY = a\sum X + b\sum X^2$

i.e.

$472.04 = 5a + 0b$

$-102.93 = 0a + 10b$

By solving

$a = 94.40$

$b = -10.29$

Therefore, $Y = 94.40 - 10.29X$

For SHTPI

FY	Actual sales(Y)	X	X^2	XY
2061/062	58.34	-2	4	-116.68
2062/063	70.4	-1	1	-70.4
2063/064	46.55	0	0	0
2064/065	55.57	1	1	55.57
2065/066	52.9	2	4	105.8
Total	283.75	0	10	-25.71

$Y = a + bX$

Then

$\sum Y = na + b\sum X$

$\sum XY = a\sum X + b\sum X^2$

i.e.

$283.75 = 5a + 0b$

$-25.71 = 0a + 10b$

By solving

a = 56.75

b = -2.57

Therefore, Y = 56.75-2.57X

APPENDIX- 3

Statistical Calculation

A. Production Budget

Unit in ('000) kg

For HSTP							
FY	Budgeted (X)	Actual (Y)	$(X-\bar{X})$	$(Y-\bar{Y})$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$	$(X-\bar{X})(Y-\bar{Y})$
2061/062	135	129.61	26	99.91	676	1149.96	881.69
2062/063	130	109.1	21	13.41	441	179.75	281.55
2063/064	100	83.92	-9	-11.77	81	138.6	105.96
2064/065	100	78.91	-9	-16.79	81	281.84	151.09
2065/066	80	76.94	-29	-18.76	841	351.75	543.89
Total	545	478.47	0	0	2120	2101.89	1964.18

Let X and Y be the Budgeted Production Unit and Actual Production Unit respectively

For Budgeted Production

Mean ($\bar{X}$) = $\frac{\sum X}{N} = \frac{545}{5} = 109$

S.D. (±) = $\sqrt{\frac{\sum (X-\bar{x})^2}{N}} = \sqrt{\frac{2120}{5}} = 20.59$

$C.V = \frac{\pm}{x} \times 100\% = \frac{20.59}{109} \times 100\% = 18.89\%$

For Actual Production

Mean ($\bar{Y}$) = $\frac{\sum Y}{N}$ = $\frac{478.47}{5}$ = 95.69

S.D. (±) = $\sqrt{\frac{\sum (X-\bar{x})^2}{N}}$ = $\sqrt{\frac{2101.89}{5}}$ = 20.50

$C.V = \frac{\pm}{x} \times 100\%$ = $\frac{205}{95.69} \times 100\%$ = 21.43%

Unit in ('000) kg

For SHTPI							
FY	Budgeted (X)	Actual (Y)	$(X-\bar{X})$	$(Y-\bar{Y})$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$	$(X-\bar{X})(Y-\bar{Y})$
2061/062	70	63.9	11	5.35	121	28.64	58.87
2062/063	70	58.29	11	-0.26	121	0.07	-2.86
2063/064	35	53.45	-24	-5.09	576	25.93	122.21
2064/065	64	62	5	36.45	25	11.92	17.26
2065/066	56	55.1	-3	-3.45	9	11.92	10.35
Total	295	292.74	0	0	852	78.472	205.84

For Budgeted Production

Mean ($\bar{X}$) = $\frac{\sum X}{N}$ = $\frac{295}{5}$ = 59

.D. (±) = $\sqrt{\frac{\sum (X-\bar{x})^2}{N}}$ = $\sqrt{\frac{852}{5}}$ = 1305

$C.V = \frac{\pm}{x} \times 100\%$ = $\frac{13.05}{59} \times 100\%$ = 22.13%

For Actual Production

$$\text{Mean } (\bar{Y}) = \frac{\sum Y}{N} = \frac{292.74}{5} = 58.55$$

$$\text{S.D. } (\pm) = \sqrt{\frac{\sum (X-\bar{x})^2}{N}} = \sqrt{\frac{78.47}{5}} = 3.96$$

$$C.V = \frac{\pm}{x} \times 100\% = \frac{3.96}{58.55} \times 100\% = 6.77\%$$

B. Calculation of Combine SD. and T-test Unit in ('000) kg

FY	HSTP			SHTPI		
	Actual (x)	$(X-\bar{X})$	$(Y-\bar{Y})$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$	$(X-\bar{X})(Y-\bar{Y})$
2061/062	129.61	26	1149.96	63.9	5.35	28.64
2062/063	109.1	21	179.75	58.29	-0.26	0.07
2063/064	83.92	-9	138.6	53.45	-5.09	25.93
2064/065	78.91	-9	281.84	62	36.45	11.92
2065/066	76.94	-29	351.75	55.1	-3.45	11.92
Total	478.47	0	2101.89	292.74	0	78.472

$$\text{A.M. } (\bar{X}_1) = \frac{\sum X}{N_1} = \frac{478.47}{5} = 95.69$$

$$\text{A. M. } (\bar{Y}_1) = \frac{\sum Y}{N_2} = \frac{292.74}{5} = 58.55$$

$$S = \sqrt{\frac{\sum (X-\bar{X})^2 + \sum (Y-\bar{Y})^2}{N_1 + N_2 - 2}} = \sqrt{\frac{2101.89 + 78.47}{5+5-2}} = 16.51$$

$$|t| = \frac{\bar{X} - \bar{Y}}{S\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} = \frac{95.69 - 58.55}{16.51\sqrt{\frac{1}{5} + \frac{1}{5}}} = 3.56\%$$

C. Calculation of Karl Person's Coefficient Correlation and Probable Error of Coefficient of Correlation.

For HSTP

Correlation Coefficient $r_{xy} = \frac{\sum(X-\overline{X})(Y-\overline{Y})}{\sqrt{\sum(X-\overline{X})^2}\sqrt{\sum(Y-\overline{Y})^2}}$

$= \frac{1964.18}{\sqrt{2120}\sqrt{2101.89}}$ = **0.93**

Probability Error $P.E(r) = 0.6745 \times \frac{1-r^2}{\sqrt{n}}$ = $P.E(r) = 0.6745 \times \frac{1-0.93^2}{\sqrt{5}}$ = 0.0405

For SHPTI

Correlation Coefficient $r_{xy} = \frac{\sum(X-\overline{X})(Y-\overline{Y})}{\sqrt{\sum(X-\overline{X})^2}\sqrt{\sum(Y-\overline{Y})^2}}$

$= \frac{205.84}{\sqrt{852}\sqrt{78.47}}$ **= 0.796**

Probability Error $P.E(r) = 0.6745 \times \frac{1-r^2}{\sqrt{n}}$ = $P.E(r) = 0.6745 \times \frac{1-0.796^2}{\sqrt{5}}$ = 0.1105

D. Calculation of Least Square Trend for HSTP

Unit in ('000) kg

FY	Actual sales(Y)	X	X^2	XY
2061/062	129.61	-2	4	-259.21
2062/063	109.1	-1	1	-109.1
2063/064	83.92	0	0	0
2064/065	78.91	1	1	78.91
2065/066	76.94	2	4	153.88
Total	478.47	0	10	-135.53

Y = a + bX

Then

$\sum Y = na + b\sum X$

$\sum XY = a\sum X + b\sum X^2$

i.e.

478.47 = 5a + 0b

-135.53 = 0a +10b

By solving

a = 95.69
b = -13.55
Therefore, Y = 95.69-13.55X

For SHTPI

Unit in ('000) kg

FY	Actual sales(Y)	X	X^2	XY
2061/062	63.9	-2	4	-127.8
2062/063	58.29	-1	1	-58.29
2063/064	53.45	0	0	0
2064/065	62	1	1	62
2065/066	55.1	2	4	110.19
Total	292.74	0	10	-13.9

$Y = a + bX$

Then

$\sum Y = na + b\sum X$

$\sum XY = a\sum X + \sum bX^2$

i.e.

$292.74 = 5a + 0b$

$-13.90 = 0a + 10b$

By solving

a = 58.55
b = -1.39
Therefore, Y = 58.55-1.39X

APPENDIX – 4

Statistical Calculation

A. Calculation of Mean, Standard Deviation & Coefficient of Variation

Actual Production Vs Actual Sales

Unit in ('000) kg

FY	For HSTP						
	Actual production	Actual Sales	$(X-\bar{X})$	$(Y-\bar{Y})$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$	$(X-\bar{X})(Y-\bar{Y})$
2061/062	129.61	118.92	33.91	24.51	1149.96	600.59	831.06
2062/063	109.1	115.44	13.41	21.03	189.75	442.13	281.91
2063/064	83.92	76.09	-11.77	-18.32	138.6	335.73	215.77
2064/065	78.91	72.88	-16.79	-21.53	281.84	463.67	361.49
2065/066	76.94	88.73	-18.75	-5.68	351.75	32.25	106.51
Total	478.47	472.04	0	0	2101.89	1874.4	1796.69

Let X and Y be the actual sales unit and actual production unit respectively

For Actual Production

$$\text{Mean } (\bar{X}) = \frac{\sum X}{N} = \frac{478.47}{5} = 95.69$$

$$\text{S.D. } (\pm) = \sqrt{\frac{\sum (X-\bar{x})^2}{N}} = \sqrt{\frac{2101.89}{5}} = 20.50$$

$$C.V = \frac{\pm}{x} \times 100\% = \frac{20.50}{95.69} \times 100\% = 21.43$$

For Actual Sales

$$\text{Mean } (\bar{Y}) = \frac{\sum Y}{N} = \frac{472.04}{5} = 94.41$$

$$\text{S.D. } (\pm) = \sqrt{\frac{\sum (X-\bar{x})^2}{N}} = \sqrt{\frac{1874.38}{5}} = 19.36$$

$$C.V = \frac{\pm}{x} \times 100\% = \frac{19.362}{94.41} \times 100\% = 20.51$$

Unit in ('000) kg

FY	For SHTPI						
	Actual production(X)	Actual Sales(Y)	$(X-\bar{X})$	$(Y-\bar{Y})$	$(X-\bar{X})^2$	$(Y-\bar{Y})^2$	$(X-\bar{X})(Y-\bar{Y})$
2061/062	63.9	58.34	5.35	1.59	28.64	2.52	8.5

2062/063	58.29	70.4	-0.26	13.65	0.07	186.27	-3.55
2063/064	53.45	46.55	-5.09	-10.2	25.93	104.08	51.95
2064/065	62	55.57	3.45	-1.18	11.92	1.4	-4.08
2065/066	55.1	52.9	-3.45	-3.85	11.92	14.82	13.29
Total	292.74	283.75	0	0	78.47	309.09	66.11

For Actual Production

$$\text{Mean } (\bar{X}) = \frac{\sum X}{N} = \frac{292.74}{5} = 58.55$$

$$\text{S.D. } (\pm) = \sqrt{\frac{\sum (X - \bar{x})^2}{N}} = \sqrt{\frac{78.47}{5}} = 3.96$$

$$C.V = \frac{\pm}{\bar{x}} \times 100\% = \frac{3.96}{58.55} \times 100\% = 6.77\%$$

For Actual Sales

$$\text{Mean } (\bar{Y}) = \frac{\sum Y}{N} = \frac{283.75}{5} = 56.75$$

$$\text{S.D. } (\pm) = \sqrt{\frac{\sum (X - \bar{x})^2}{N}} = \sqrt{\frac{309.09}{5}} = 7.86$$

$$C.V = \frac{\pm}{\bar{x}} \times 100\% = \frac{7.86}{56.75} \times 100\% = 13.85\%$$

B. Calculation of Karl person's coefficient correlation and probable error of Coefficient of Correlation.

For HSTP

$$\text{Correlation coefficient } r_{xy} = \frac{\sum (X - \bar{X})(Y - \bar{Y})}{\sqrt{\sum (X - \bar{X})^2} \sqrt{\sum (Y - \bar{Y})^2}}$$

$$= \frac{1796.69}{\sqrt{2101.89}\sqrt{1874.38}} = \mathbf{0.905}$$

Probability Error $P.E(r) = 0.6745 \times \frac{1-r^2}{\sqrt{n}}$

$$= P.E(r) = 0.6745 \times \frac{1-0.905^2}{\sqrt{5}} = 0.0546$$

For SHTPI

Correlation coefficient $r_{xy} = \frac{\sum (X-\overline{X})(Y-\overline{Y})}{\sqrt{\sum (X-\overline{X})^2}\sqrt{\sum (Y-\overline{Y})^2}}$

$$= \frac{66.11}{\sqrt{78.47}\sqrt{309.1}} = \mathbf{0.424}$$

Probability Error $P.E(r) = 0.6745 \times \frac{1-r^2}{\sqrt{n}}$

$$= P.E(r) = 0.6745 \times \frac{1-0.424^2}{\sqrt{5}} = 0.025$$

APPENDIX-5

A. Profit & loss account of HSTP for five years from FY 2061/062 to 2065/066

Amount in Rs. ('000)

Particular	2061/062	2062/063	2063/064	2064/065	2065/066
Net Sales(A)	18550.74	18547.43	14760.49	12243	16592.32
Production of materials	12247.67	10030.73	7458.48	7930.73	6866.75
Manufacturing cost	2489.06	1789.74	1928.38	2011.57	1923.8

Cost of goods manufacturing	14736.73	11820.47	9386.86	9942.3	8790.55
Add : opening stock	2387.84	1232.4	1833.4	2985.66	1172.3
Less : closing stock	1232.4	1833.4	2985.66	1172.3	1931.52
Cost of goods sold (B)	15892.17	11219.46	8234.6	11755.65	8031.33
Gross profit (A-B)	2658.57	7327.97	6525.89	487.35	8560.99
Less : operating expenses					
Administration cost	2167.13	1587.45	1775.98	2022.5	1833.62
Other operating cost	275.68	475.34	552.61	269.87	435.97
Net operating profit/(loss)	215.76	5265.14	4197.3	-1805.02	6291.4
Add : non operating income					
Misc. income	3.78	7.64	1.75	145.43	75.38
By product sales	85.94	45.84	48.94	73.84	38.47
Total income/(loss)	415.48	5318.61	4247.98	-1585.75	6405.25
Less : non operating expenses	138.72	165.34	133.14	79.97	145.83
Net profit (loss)	166.76	5153.28	4114.83	-1665.72	6259.411

B. Profit & loss account of SHTPI for five years from FY 2061/062 to 2065/066

Amount in Rs. ('000)

Particular	2061/062	2062/063	2063/064	2064/065	2065/066
Net Sales(A)	6776.99	11170.38	6135.98	9496.96	9803.61
Production of materials	3685.18	3774.58	4845.26	5132.94	5187.45
Manufacturing cost	2314.02	1297.48	1351.11	2408.1	2213.98
Cost of goods manufacturing	5999.2	5072.06	6196.37	7541.04	7401.43
Add : cost of opening stock	1799.43	2114.48	966.65	1713.67	3321.06
Less : cost of closing stock	2114.48	966.65	1713.67	3321.06	4008.18
Cost of goods sold (B)	5684.15	6219.9	5449.35	5933.31	6714.32
Gross profit (A-B)	1092.84	4950.48	686.62	3563.31	3089.29

Less : operating expenses					
Administration cost	783.2	970.08	1103.46	1497.53	1473.36
Depreciation and amortization	199.36	2977.49	305.019	239.09	120.97
Net operating profit/(loss)	110.28	1002.91	721.86	1826.26	1494.97
Add : non operating income					
Vivid. income	0.4	13.93	60.56	115.84	129.27
Sales of cutting	42.84	50.4	8.5	0	1.5
Total income/(loss)	153.52	1067.24	790.92	1942.1	1625.74
Less : non operating expenses	93.24	125.51	67.53	95.24	84.14
Net profit (loss) for the year	60.29	941.73	723.38	1846.87	1541.6

C. Balance sheet of HSTP for five years from FY 2061/062 to 2065/066 Ending 31st Ashad each year

Amount in Rs. ('000)

Particulars	2061/062	2062/063	2063/064	2064/065	2065/066
Liabilities					
Share capital	9088.767	9574.784	9178.652	9887.126	10661.688
Resurve and surplus					
Profit & loss A/C	274.86	4715.492	8909.024	7731.634	13665.715
General reserve	378.645	712.644	633.945	145.612	470.942
Other liabilities and provisions					
Outstanding salary	175.945	430.675	465.638	323.912	545.748

Provision for tax	145.475	338.675	435.945	233.225	379.675
Sundry creditors	432.739	645.339	548.683	677.786	679.394
Bonus to staff	145.944	316.832	475.814	-	235.648
Outstanding interest	74.612	188.472	223.558	190.475	142.585
Total	10716.987	16922.913	20871.259	19189.77	26781.395
Assets					
Fixed assets	7513.569	10098.778	10368.375	9545.473	13845.063
Debtors	588.79	975.936	1748.942	1844.108	1745.283
Cash and bank	744.839	2790.996	3299.768	2542.373	4533.111
Closing stock	1232.4	1833.4	2985.66	2172.304	2931.523
Bills receivable	274.738	518.615	1048.938	945.919	1348.745
miscellaneous expenses	174.819	272.339	446.937	996.754	1212.931
Prepaid expenses	187.832	432.849	972.639	1142.839	1164.739
Total	10716.987	16922.913	20871.259	19189.77	26781.395

D. Balance sheet of SHTPI for five years 2061/062 to 2065/066 ending 31st Ashad each year

Amount in Rs. ('000)

Particulars	2061/062	2062/063	2063/064	2064/065	2065/066
Liabilities					
Share capital	8008.336	7175.775	8688.788	7961.260	8824.829
Profit & loss A/C	60.285	941.729	723.381	1846.867	1541.598
Labor provident fond	-	142.552	146.418	147.838	158.822
Tax payable	68.734	75.839	54.633	77.128	81.932
Sundry creditors	433.506	286.253	403.735	564.949	475.174
Outstanding expenses	278.432	375.937	348.286	344.943	545.338
Total	8849.293	8998.085	10365.241	10942.985	11545.761

Assets					
Total fixed assets	5706.977	5294.961	7571.474	7979.473	7687.903
Quick assets	104.210	140.925	171.906	141.725	216.045
Store inventories	687.754	755.403	928.078	606.005	704.962
Closing stock	1799.430	2114.484	966.459	1713.665	2321.063
Prepaid expenses	271.987	379.598	379.410	289.385	296.060
Sundry debtors	278.935	312.714	347.914	212.732	319.728
Total	8849.293	8998.085	10365.241	10942.985	11545.761