d)

	bi	Sbi	t	P-value
Constant	6356.17	0.838701	7.578	
X_1	0.56038	0.15811	3.544	0.002
X_2	-31.2077	8.95905	-3.483	0.025
X_3	-327.503	149.169	-2.195	0.001
X_4	-113.895	16.2604	-7.004	0.000
X_5	-621.458	147.828	-4.203	0.000

ANOVA

Source	Sum of square	df	Mean square	F	P-value
Regression	12204000	5	2440800	20.28	0.00
Residual	2166000	18	120333.33		
Total	14370000	23			

iii) H.

Null hypothesis (H_0): $\beta_3 = 0$

There is no significant impact of ~~X_3 dependent variable in independent variable.~~ X_3 on Y

Alternative hypothesis (H_1): $\beta_3 \neq 0$

There is at ~~least one~~ significant impact of X_3 on Y

impact of dependent variable in dependent variable

Test-Statistic $\frac{b_3}{Sb_3} = \frac{-327.503}{199.969}$

calculated t-value of $X_3 = -2.195$

tabulated t-value of X_3

$= t_{(\alpha/2),(n-k-1)}$

$= t_{n-k-1, \alpha}$

$= t_{18, 0.05}$

$= 2.101$

Decision

Here, tabulated value is lesser than calculated value. So we reject H_0. Mean there is significant impact of X_3 on Y.

iii)

Construct 99% confidence interval estimate for the regression coefficient of square feet heated space

$$1 - \alpha = 99\%$$

$$\alpha = 1\%$$

$$= 0.01$$

we have

$$b_i \pm t_{n-k-1, \alpha} \cdot S_{b_i}$$

$$b_1 \pm t_{n-k-1, \alpha} * S_{b_1}$$

~~$0.56038 \pm 2.101 * 0.15811$~~

0.56038 ± 0.3321

$0.56038 \pm 2.878 * 0.15811$

0.56038 ± 0.4550

$$0.10538 \leq B_1 \leq 1.01538$$

SST
SSE

MSE

Date
Page

ii) Standard error of the estimate = $\sqrt{MSE}$

$= \sqrt{120333.33}$

$= 346.89$

Interpretation

The average variation of observed values of dependent variable around it's fitted equation is 346.89

$R^2 = \frac{SSR}{TSS} = \frac{12209000}{14366000}$

$= \frac{12209000}{14370000} = 0.8492$

Interpretation

84.92% variation in dependent variable is explained by 5 independent variable.

$$R^2 = 1 - \left\{ (1 - R^2) \times \frac{n - 1}{n - k - 1} \right\}$$

$$= 1 - \left\{ (1 - 0.8492) \times \frac{24 - 1}{24 - 5 - 1} \right\}$$

$$= 0.8073$$

Interpretation

80.73 % of variation in dependent variable is ~~expressed~~ explained by 5 independent variable, after adjusting given degree of freedom

vi)

$$Y = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5$$

$$= 6356.17 + 0.5603 * 1295 + -31.2072 * 18 + -327.503 * 5 + -113.895 * 3 + -621.458 * 1$$

$$= 3919.4655$$

0.19268

vii) $H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$

$H_1: \beta_i \neq 0$ (where $i = \{1, 2, 3, 4, 5\}$)

Test-statistic

Calculated F-value = 20.28

Tabulated F-value

Critical value

$= F_{ICS\, n-IC-1, \alpha}$

$= F_{5, 18, 0.05}$

$= 2.77$

Critical region:

Decision $F_{cal} > F_{tab}$,

Here, calculated value is greater than tabulated value so we reject H_0. There is no sig There is significant impact of at least one of independent variable on dependent variable