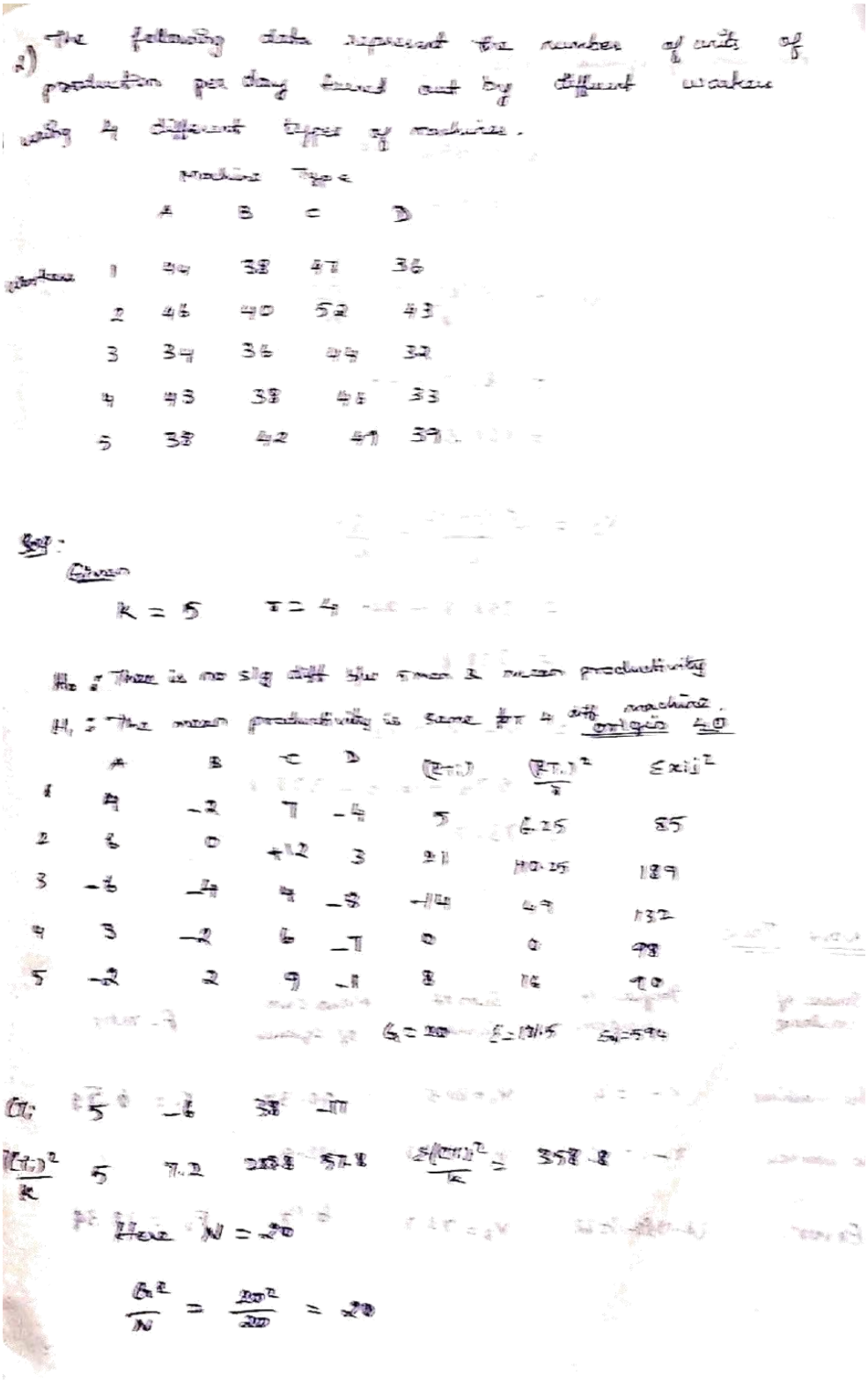

2) The following data represent the number of units of production per day turned out by different workers using 4 different types of machines.

Workers	Machine Type A	B	C	D
1	44	38	47	36
2	46	40	52	43
3	34	36	44	32
4	43	38	49	33
5	38	42	49	39

Sol:

Given

$k = 5 \quad r = 4$

H_0 : There is no sig diff b/w mean productivity

H_1 : The mean productivity is same for 4 diff machine types

	A	B	C	D	$(T_i.)$	$(T_i.)^2$	$\sum x_{ij}^2$
1	4	-2	7	-4	5	6.25	85
2	6	0	+12	3	21	110.25	189
3	-6	-4	4	-5	-11	4.9	132
4	3	-2	6	-7	0	0	98
5	-2	2	9	-1	8	16	90
					$G = 29$	$\sum = 131.5$	$S = 594$

CF: $\frac{G^2}{N} = \frac{29^2}{20} = 42.05$

$\frac{(T_i.)^2}{k}$ 5 7.2 28.8 57.8 $\frac{\sum (T_i.)^2}{k} = 358.8$

Here $N = 20$

$\frac{G^2}{N} = \frac{29^2}{20} = 42.05$

Total sum of squares $(V) = \sum\sum x_{ij}^2 - \frac{G^2}{N}$

$V = 594 - 20$

$= 574$

$V_1 = \frac{\sum (RT_i)^2}{8} - \frac{G^2}{N}$

$= 181.5 - 20$

$= 161.5$

$V_2 = \frac{\sum (CT_i)^2}{k} - \frac{G^2}{N}$

$= 358.8 - 20$

$= 338.8$

$V_3 = V - V_1 - V_2$

$= 574 - 161.5 - 338.8$

$= 73.7$

ANOVA Table

Source of variance	Degrees of freedom	Sum of Squares	Mean sum of squares	F-ratio.
b/w machines	$k-1 = 4$	$V_1 = 161.5$	40.37	$F_1 = 6.58$
b/w workers	$r-1 = 7$	$V_2 = 338.8$	112.9	
Error.	$(k-1)(r-1) = 12$	$V_3 = 73.7$	6.14	$F_2 = 18.39$

The critical value of F_1 at 5% level of significance with degrees of freedom (4, 12) is 3.26.

$|F_1| = 6.58 > 3.26$.

The critical value of F_2 at 5% level of significance with degrees of freedom (3, 12) is 3.49

$|F_2| = 18.39 > 3.49$

There is significance b/w 5 men & productivity also diff b/w 5 men & no. of machines.