APPLIED MECHANICS LAB.

INSTRUCTION SHEET

DOUBLE PURCHASE WINCH CRAB.

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1. AIM:

To determine Mechanical Advantage (M.A), Velocity Ratio (V.R), efficiency (h) and to check Law of machine of a Double Purchase Crab Winch.

2. EQUIPMENT REQUIRED:

2.1 Double Purchase Crab Winch
2.2 Weights.
2.3 Vernier caliper
2.4 Rope.
2.5 Effort pan & hanger.

3. DESCRIPTION ABOUT MACHINE.

No of teeth of the first pinion T1 =
No of teeth on the first spur wheel T2 =
No of teeth on the second pinion T3 =
No of teeth on the 2nd spur wheel T4 =
Diameter of the drum shaft =
Diameter of the pulley =
Weight of the loading hanger =
Weight of the effort hanger =

4. THEORY.

Operation of Purchase crab is based on the principle of gears. This is an improvement over the single purchase crab in which there is a single pair of gears and no intermediate shaft. This machine provides a higher velocity ratio; as a result it can be used for lifting very heavy loads by applying relatively small efforts.

Intermediate spindle carries a pinion having T3 teeth and a spur wheel with T2 teeth. The spur wheel is geared with a pinion with T1 teeth witch can be rotated by a handle of length 'R'. The pinion with T3 teeth is geared with a spur wheel with T4 teeth, which is mounted on another axle. A drum of radius 'r' is mounted on the axle shaft. A rope is wound round the drum, one end of which is fixed to the drum and the other end is free to carry the load.

4.1 MECHANICAL ADVANTAGE

The Mechanical Advantage is the ratio of Load (W) lifted to Effort (P) Applied.

Thus, M.AÞ W/P

4.2 VELOCITY RATIO.

Let the pulley is rotated once, so the distance moved by the effort will be **Y=2πR.**The intermediate spur will make T1/T2 of a revolution. The axle shaft and the drum will make (T1/T2)x(T3/T4) of a revolution. So the load will move through a distance of

$$X = 2\pi r \times \{(T_1 / T_2) \times (T_3 / T_4)\}$$

The Velocity Ratio (V.R) is the ratio of the distance moved by effort (Y) to the distance moved by Load (X).

Thus, V.RÞ Y/X

$$Þ \frac{R.T_2.T_4}{r.T_1.T_3}$$

4.3 EFFICIENTY(h):-

(h) = output / input

$$= \frac{\text{load lifted x distance through whitch load is lifted}}{\text{effort applied x distance covered by the effort}}$$

$$= \frac{W \times X}{P \times Y} = \frac{W/P}{Y/X} = \frac{M \cdot A}{V \cdot R}$$

4.4 LAW OF MACHINE

It provides the relationship between effort and the corresponding load lifted by the application of effort.

P = MW + C ---------- (1)

Where P = Effort applied

M = Const. called coefficient of friction which equal to slope of the line.

W = Load lifted.

C = Const. called machine friction.

5 PROCEDURE:

5.1 Measure diameter of pulley, drum and no. of teeth on the gear wheels then find out V.R.

5.2 Measure machine friction 'C' at no load condition.

5.3 Take ten readings taking different loads and efforts.

5.4 Calculate efficiency in each case and the mean efficiency.

5.5 Draw the graph between load Vs effort.

5.6 Determine the coefficient of friction 'M' from the graph.

5.7 By putting the values of 'M' and 'C' in equation (1) we determine from which the law of machine, we can find out the amount of effort required to lift any load.

6 TABULATION.

Sl no	'C' Machine friction	'M' Coefficient Of Machine friction	V.R	W In (kg)	P in (kg)	Mechanical Advantage. P/W	h efficiency	Mean (h)

7. CALCULATION:

8. CONCLUSION: