SCHOOL OF MECHANICAL ENGINEERING
KIIT UNIVERSITY
INSTRUCTION SHEET
APPLIED MECHANICS & DYNAMICS LAB.
SIMPLE SCREW JACK.

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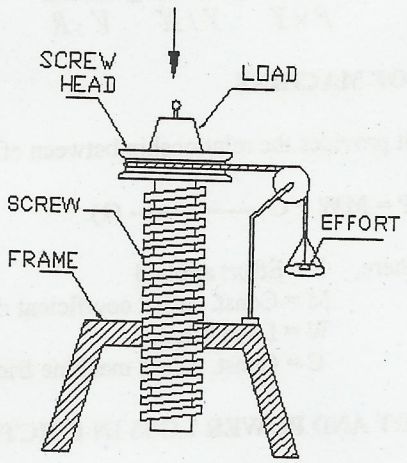
1. AIM:

To conduct experiment with a simple screw jack & to determine the following.

a) Mechanical Advantage (M.A),
b) Velocity Ratio (V.R),
c) Angle of friction. Ø
d) Mechanical efficiency (η)
e) Law of machine
f) Effort and power lost in friction.
g) Coefficient of machine friction (M)



SCREW JACK

2. EQUIPMENT REQUIRED.

2.1 Simple screw jack.
2.2 Load Weights.
2.3 Weight Box
2.4 Slide calipers.
2.5 Effort pan & hanger.

3. THEORY.

Lifting machines are those machines which are used for lifting loads. The effort is applied at one point of the machine and the weight is lifted at the other point of the machine. Screw Jack is a device which enables us to lift a heavy load (W)by applying a comparatively smaller effort (P).

3.1 MECHANICAL ADVANTAGE

The Mechanical Advantage is the ratio of load (W) lifted to effort (P) applied.

Thus, M.A⇒W/P

3.2 VELOCITY RATIO

The Velocity Ratio (V.R) is the ratio of the distance moved by effort (y) to the distance moved by load (x).

$$\text{Thus, V.R} \Rightarrow y/x = \frac{\pi D}{P}$$

Where, **D** = Diameter of screw head.
P = Pitch of screw.

3.3 ANGLE OF FRICTION (Ø)

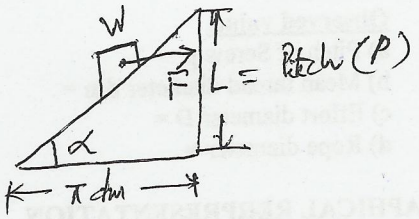
We know that,

Effort applied at mean thread diameter of the screw. $F = \frac{P \times D}{dm}$

Where, **P** = effort applied on the pan.
dm = Mean thread diameter.

and also $F = W \tan(\alpha + \emptyset)$

Where, $\alpha = \tan^{-1} \frac{P}{\pi\, dm}$



Knowing F and W, Ø can be calculated from the above relation.

3.4 EFFICIENCY(η)

(η) = output / input

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

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

3.5 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.

3.6 EFFORT AND POWER LOSS IN FRICTION.

Effort lost in friction = C
Power lost in friction = input – out put

$$= (P \times \pi D) - (W \times p)$$

4 PROCEDURE.

4.1 Measure pitch of screw and dia of screw head then find out V.R.
4.2 Measure machine friction 'C' at no load condition.
4.3 Take ten readings taking different loads and efforts.
4.4 Calculate efficiency in each case and calculate mean efficiency.
4.5 Draw the graph between load 'W' Vs effort 'P'
4.6 Determine the coefficient of friction 'M' from the graph.
4.7 By putting the values of 'M' and 'C' in equation (1) , we can find out the amount of effort required to lift any load.

5. OBSERVATION:

Sl no	'C'	'M'	Ø	V.R = $\frac{\pi D}{P}$	W in (kg)	P in (kg)	M.A=W/P	η (efficiency)	Mean (η)

6. CALCULATION:

Observed value.

a) Pitch of Screw **p** =
b) Mean thread diameter **dm** =
c) Effort diameter **D** =
d) Rope diameter =

7. GRAPHICAL RERPRESENTATION.

a) **Load Vs Effort.**
b) **Load Vs Mechanical Advantage.**
c) **Load Vs Efficiency.**

8. CONCLUDIND REMARKS: