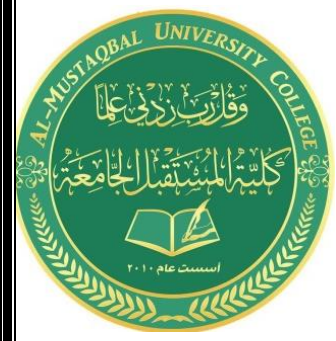

Republic of Iraq

Ministry of Higher Education & Scientific Research

Al-Mustaqbal University College

Air Conditioning and Refrigeration Techniques

Engineering Department

Blended Learning

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{Third Stage}

Theory of Machine Laboratory

Experiment No.(2): Quick Return Mechanism .

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Class: Third Stage.
First & Second Course .
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Experiment Number :- (2) .

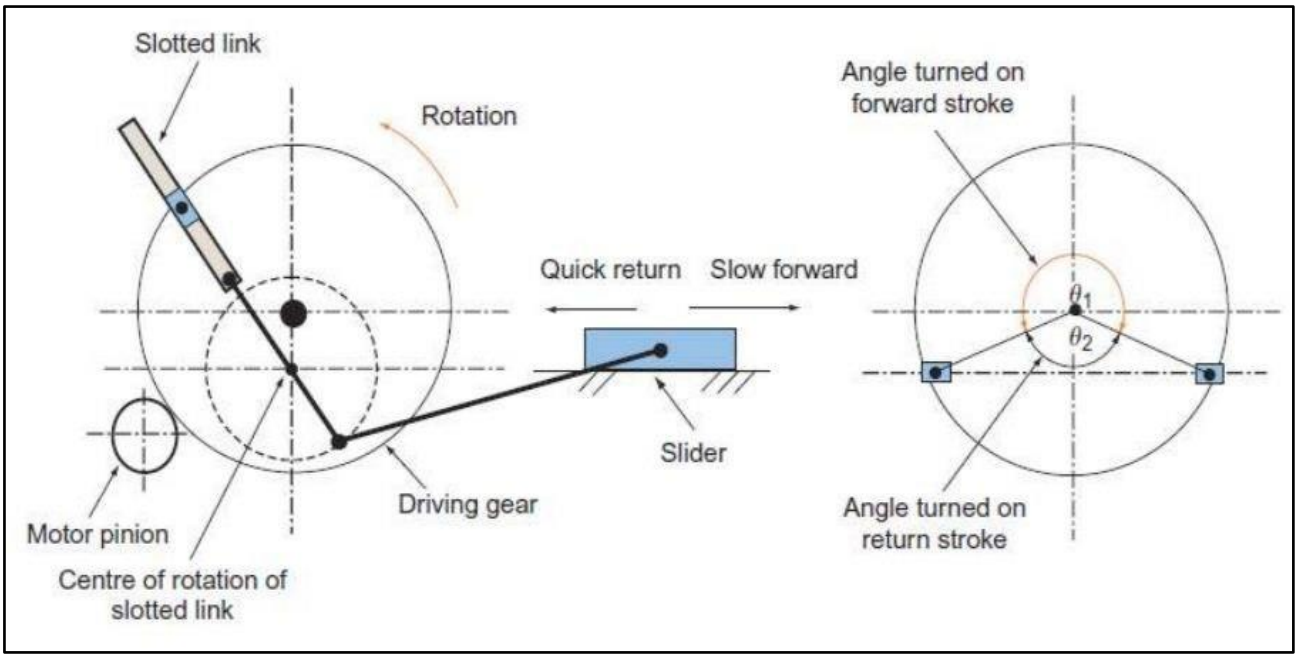
Experiment Name :- Quick Return Mechanism .

Purpose of Experiment :-

To obtain the dynamics analysis in terms of velocity and acceleration of the slider crank and to study the working principle of quick return mechanism through study the movement of arms in cutting & scraping machines , Also it is often desirable to reduce the non-productive time in machining so we use quick return mechanism to let the backward stroke operate at a higher speed than forward stroke .

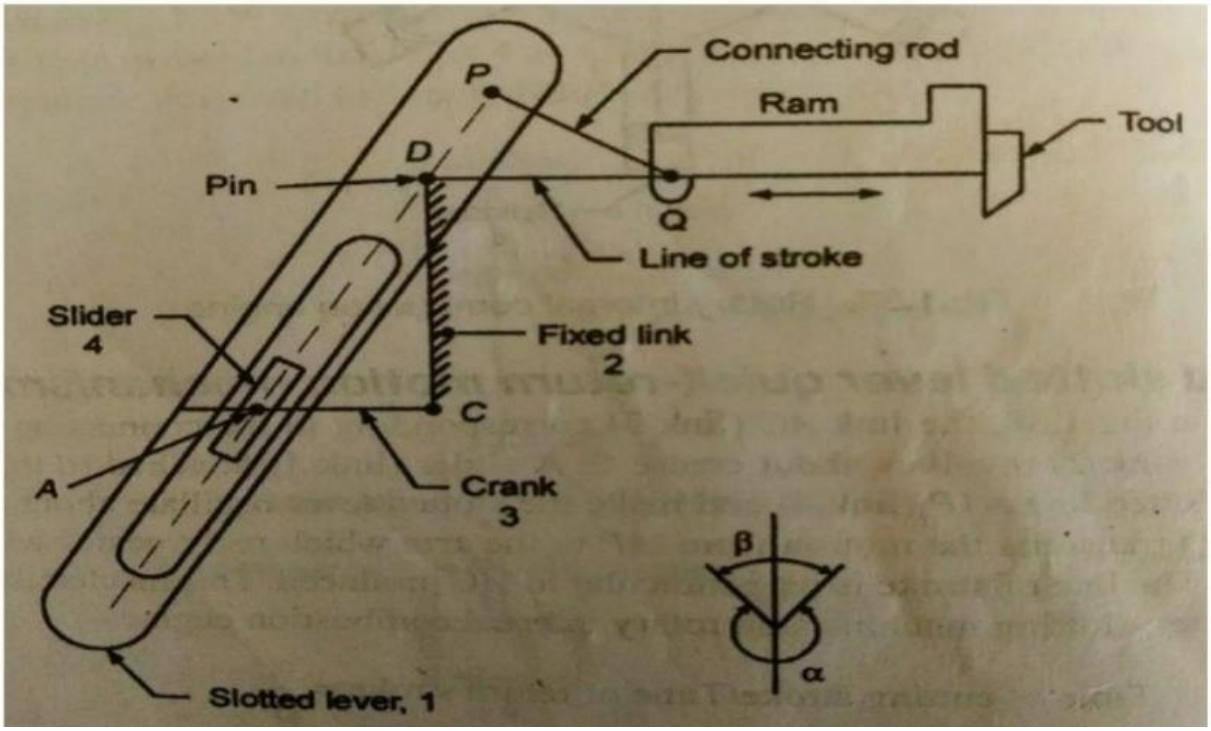
Theory:-

A quick return mechanism is an apparatus that converts circular motion(rotating motion following a circular path) into reciprocating motion(repetitive back-and-forth linear motion) in presses and shaping machines, which are utilized to shape stocks of metal into flat surfaces. Unlike the crank and slider, the forward reciprocating motion is slower rate than the return stroke. At the bottom of the drive arm, the peg only has to move through a few degrees to sweep the arm from left to right, but it takes the remainder of the revolution to bring the arm back. This is why it is called quick return mechanismm.



Mechanism:

In this mechanism, as shown in the figure, link CD (link 2) is fixed. The driving crank CA (link 3) rotates about C. The slider (link 4) attached to the crank pin at A slides along the slotted lever PA (link 1), which oscillates about pivot D. The connecting rod PQ carries the ram at Q with cutting tool; the ram reciprocates along the line of stroke.



When one of the links of a kinematic chain is fixed, the chain is known as mechanisms. It may be used for transmitting or transforming motion, There are two types of it :-

a) Simple Mechanism : A mechanism with four links is known as simple mechanism .

b) Compound Mechanism : The mechanism with more than four links known as compound mechanism .

Machine:

When a mechanism is required to transmit power or to some particular type of work,it then becomes a machine.

In such cases the links is to be designed to withstand the force (both static &kinetic safety)Alittle consideration will show that a mechanism may be regarded as a machine in which each part is reduced to the simplest form to transmit the required motion .

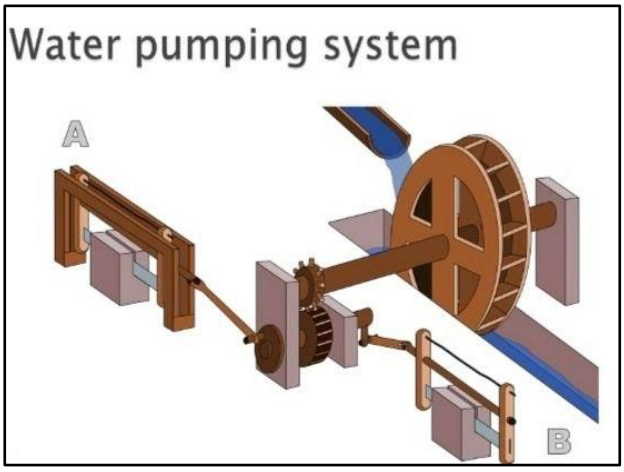
Working of Quick Return Mechanism :-

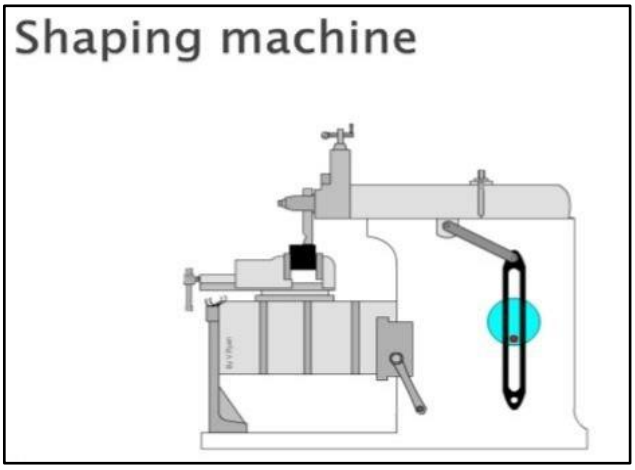
A quick return mechanism such as the one seen below is used where there is a need to convert rotary motion in to reciprocating motion. As the disc rotates the black slide moves forwards and backwards. Many machines have this type of mechanism and in the school workshop thev best. For example: the shaping machine .

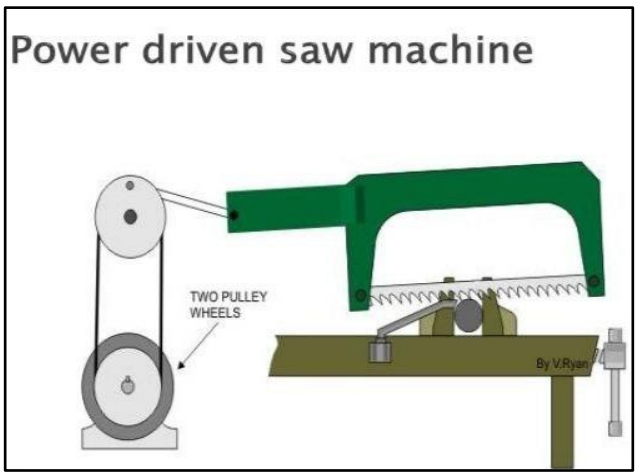
Applications :-

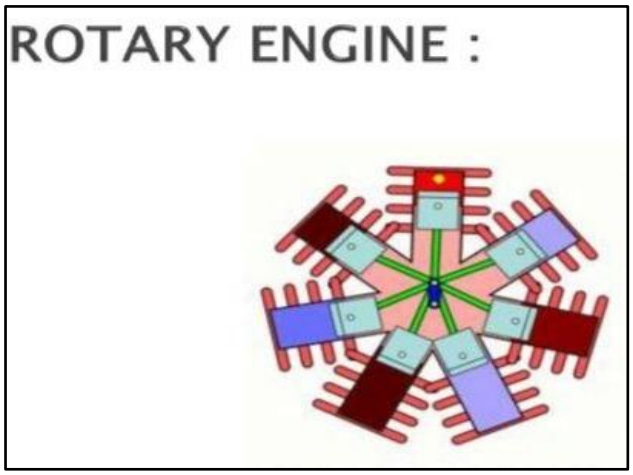
Quick return mechanism are found throughout the engineering industry in different machines :

* Shaper .
* Screw press .
* Power – driven saw .
* Mechanical actuator .
* Revolver mechanisms .
* Water pumping system .

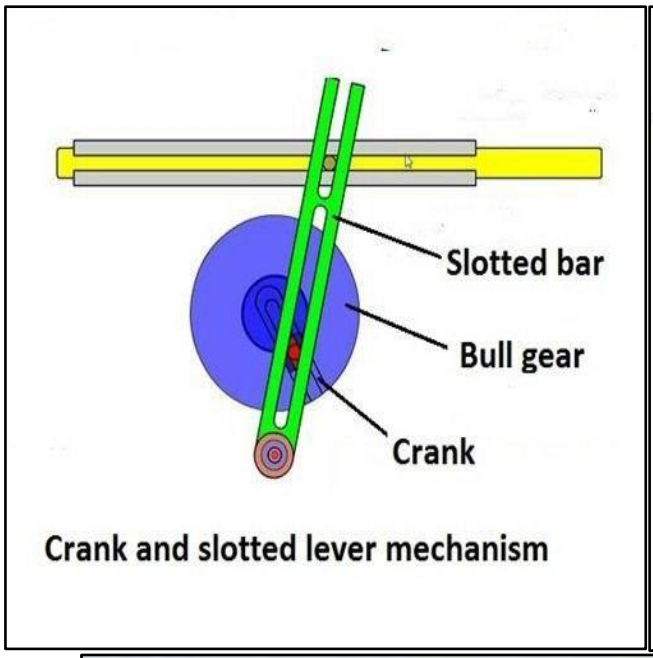




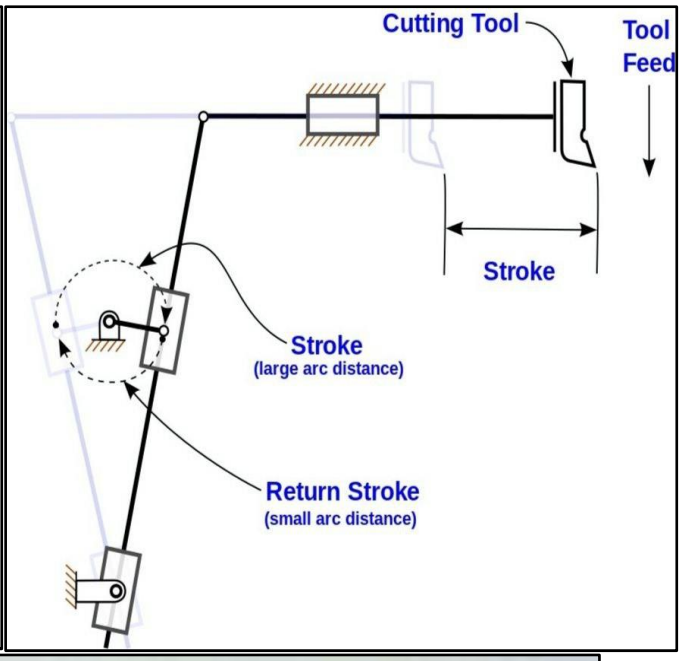


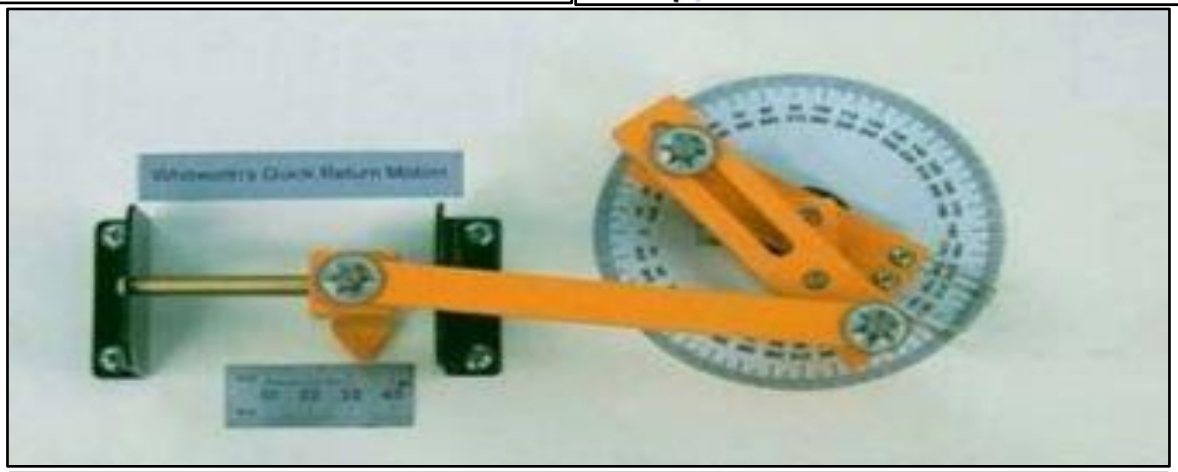


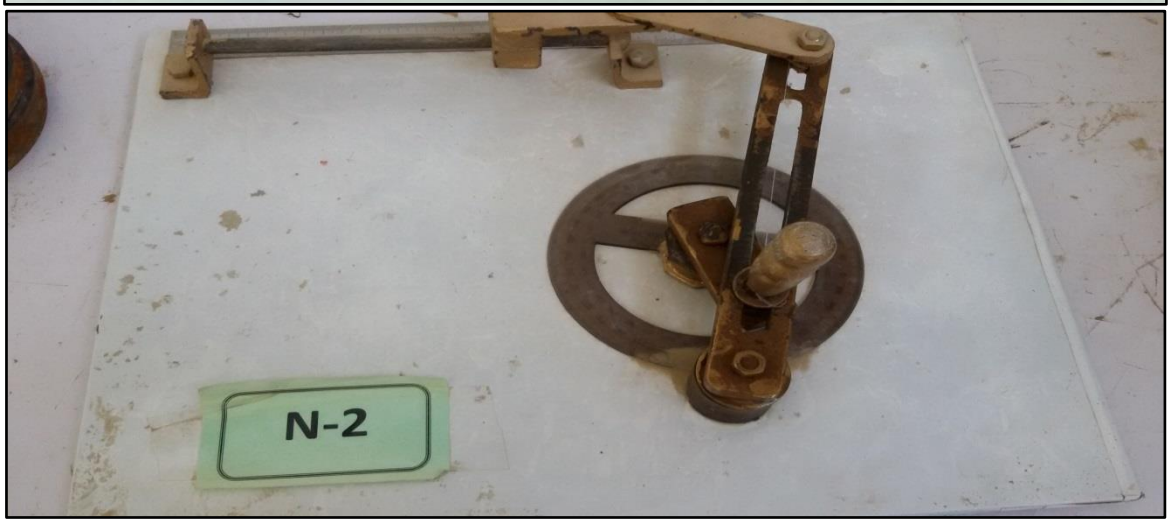
The Apparatus:-



Crank and slotted lever mechanism







Procedures :-

1. Place the rotary at zero and use this as reference point with zero displacement.
2. Rotate table clockwise and offset it by 30 degrees from starting position.
3. Note the readings on linear scale of slider for this degree of offset in inches.
4. Keep offsetting the rotary crank by 30 degree and noting thecorrespon ding position till 360 degrees.
5. Plot a graph between displacement and the crank position to obtain the curve.
6. Complete experimental values of velocities by taking points on curve and tangents then find slope on these points.
7. Plot a graph between degree and velocity.
8. Now take various points on the velocity curve and draw tangents. slope of these tangents will give us acceleration at these points.
9. Draw acceleration graph between degree and acceleration.

In Briefly :-

*Take quick return mechanism .

*Rotate crank 10 degree to get the slider reading .

*Rpeat the experiment for 36 readings .

*After taking all reading draw displacement graph .

*Take shaper mechanism .

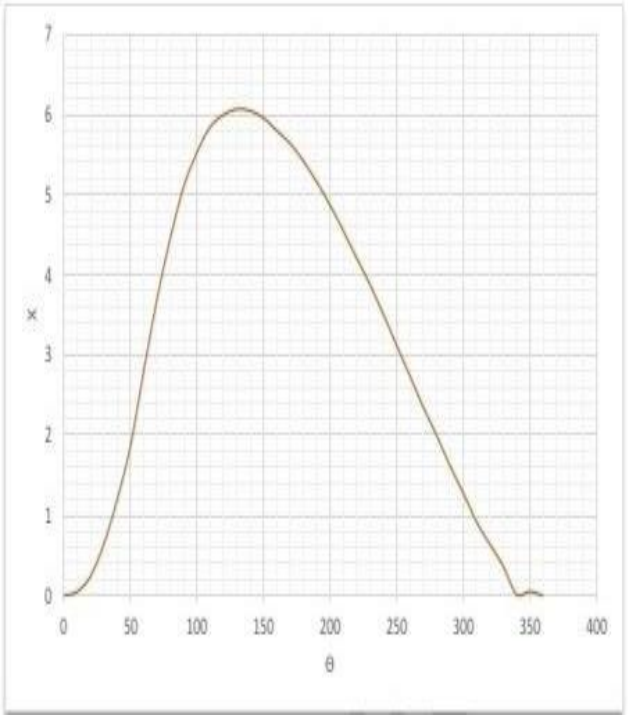
*Rotate crank 10 degree to get the slider reading .

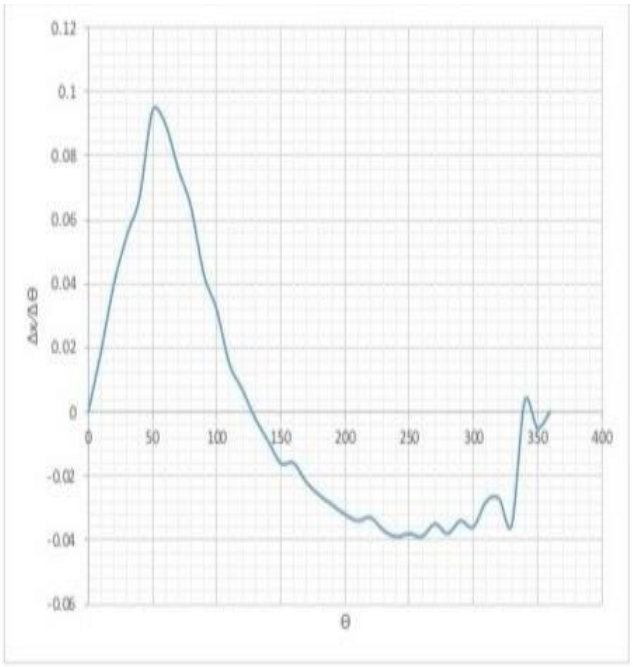
*Repeat the experiment for 36 readings .

Results and calculations:-

In this mechanism it must be founded the max. velocity and min. velocity to obtained the max. force required .

NO	θ	x	Δθ	Δx	Δx/Δθ=v
1	0	0	0	0	0
2	10	0.05	10	0.19	0.019
3	20	0.24	10	0.4	0.04
4	30	0.64	10	0.55	0.055
5	40	1.19	10	0.67	0.067
6	50	1.86	10	0.94	0.094
7	60	2.8	10	0.9	0.09
8	70	3.7	10	0.76	0.076
9	80	4.46	10	0.64	0.064
10	90	5.1	10	0.43	0.043
11	100	5.53	10	0.32	0.032
12	110	5.85	10	0.15	0.015
13	120	6	10	0.07	0.007
14	130	6.07	10	-0.02	-0.002
15	140	6.05	10	-0.09	-0.009
16	150	5.96	10	-0.16	-0.016
17	160	5.8	10	-0.16	-0.016
18	170	5.64	10	-0.22	-0.022
19	180	5.42	10	-0.26	-0.026
20	190	5.16	10	-0.29	-0.029
21	200	4.87	10	-0.32	-0.032
22	210	4.55	10	-0.34	-0.034
23	220	4.21	10	-0.33	-0.033
24	230	3.88	10	-0.37	-0.037
25	240	3.51	10	-0.39	-0.039
26	250	3.12	10	-0.38	-0.038
27	260	2.74	10	-0.39	-0.039
28	270	2.35	10	-0.35	-0.035
29	280	2	10	-0.38	-0.038
30	290	1.62	10	-0.34	-0.034
31	300	1.28	10	-0.36	-0.036
32	310	0.92	10	-0.28	-0.028
33	320	0.64	10	-0.27	-0.027
34	330	0.37	10	-0.353	-0.0353
35	340	0.017	10	0.033	0.0033
36	350	0.05	10	-0.05	-0.005
37	360	0	0	0	0





Also it must be founded the acceleration by using the formula:($\Delta^2x/\Delta\theta^2$) and graph it with θ

Discussion:-

1.) What are the max. & min. velocity for milling machine and what the factors required?

2.) What is the meaning of quick return mechanism ?

3.) What the goal of using quick return mechanism in machines ?

4.) What are the applications of quick return mechanism ?

5.) What are the types of quick return mechanism ?

Thank You