

Deadline: March 7, 2024

(Dropbox file request: <https://www.dropbox.com/request/J43uA5ee0iwBX0wJxHiD>)

Name: _____ Number: _____

Use the program MUBOKAP, presented in class and made available in your dropbox to perform the kinematic analysis of the mechanism presented in the figure. Deliver the following information

- (1) Identify the system bodies, their body fixed coordinate systems and locate the XY frame.
- (2) In the exploded views of each body identify the body fixed frames, points required to define the kinematic joints and provide their coordinates.
- (3) Establish a set of initial positions and orientations of the bodies
- (4) Build and present the input file required by the kinematic analysis program.
- (5) Simulate the system with MUBOKAP and present the plots for the trajectories and time variation of the quantities listed in the description of your mechanical system.

If any dimension is missing or you feel as being required just measure it in the drawing and scale it appropriately.

NOTE: Depending on your student number, select one of the 4 mechanisms for your homework. The algorithm for the selection is: $\text{MechanismNumber} = \text{StudentNumber} - \text{Integer}(\text{StudentNumber}/4) \times 4 + 1$.

Example for Student number 023457 \rightarrow $\text{MechanismNumber} = 023457 - 5864 \times 4 + 1 = 2$

Note that $\text{Integer}(\text{StudentNumber}/4)$ is the integer obtained by truncation of the real number. In `Matlab` just calculate the mechanism number using:

$\text{MechanismNumber} = \text{StudentNumber} - \text{floor}(\text{StudentNumber}/4) \times 4 + 1;$

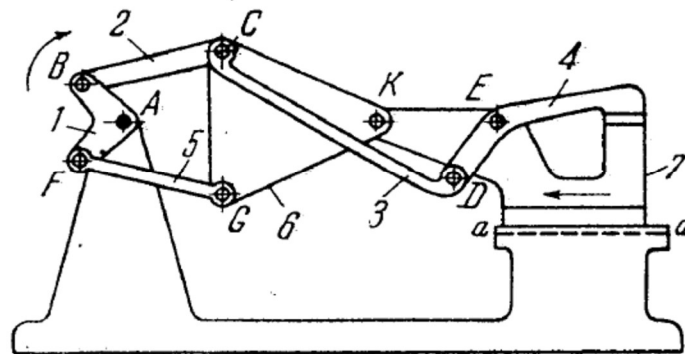
Note that, in the end you will have the same mechanism number of the one used in the 1st homework for which a solution is available in the dropbox using the methodology of homework #1.

1641

SLIDER-CRANK GRIPPING AND FEEDING
MECHANISM*

SC

GC



The lengths of the links comply with the conditions: $\overline{AB} = \overline{AF}$, $\overline{BC} = \overline{FG} = \overline{CG}$, $\overline{CK} = \overline{GK} = 3\overline{AB}$, $\overline{KE} = 2.2\overline{AB}$, $\overline{DE} = 1.2\overline{AB}$ and $\overline{CD} = 4.6\overline{AB}$. Slider 7 is reciprocated along fixed guides $a-a$ by connecting rod 6 which is actuated from double crank 1 through intermediate links 2 and 5. By means of intermediate link 3, the stock is clamped by link 4 which turns about axis E of slider 7.

572

Required:

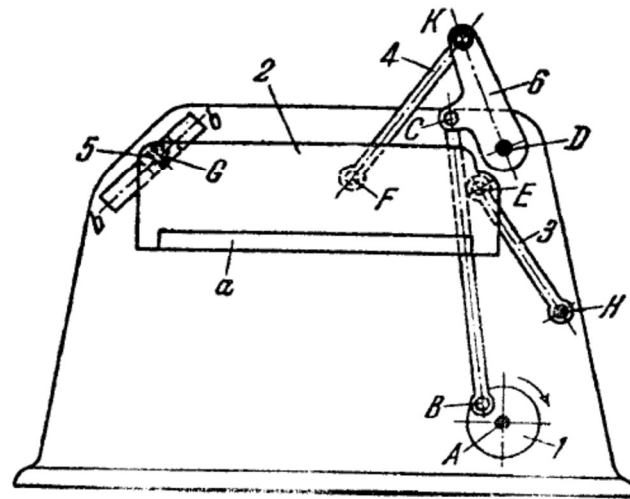
Trace the trajectory of two points in the face of the gripper in bodies 4 and 7 that represent the 'scissor' motion of the gripper.

1673

SLIDER-CRANK BLADE MECHANISM OF A TRIMMING MACHINE

SC

FD



Holder 2 of blade *a* is connected by turning pairs *E*, *F* and *G* to links 3 and 4 and to holder 5. Link 3 turns about fixed axis *H*. Slider 5 moves along fixed guides *b-b*. Link 4 is connected by turning pair *K* to rocker arm 6 of four-bar linkage *ABCD*. When crank 1 rotates about fixed axis *A*, holder 2 with blade *a* has a complex motion which accomplishes the cutting operation.

500

Required:

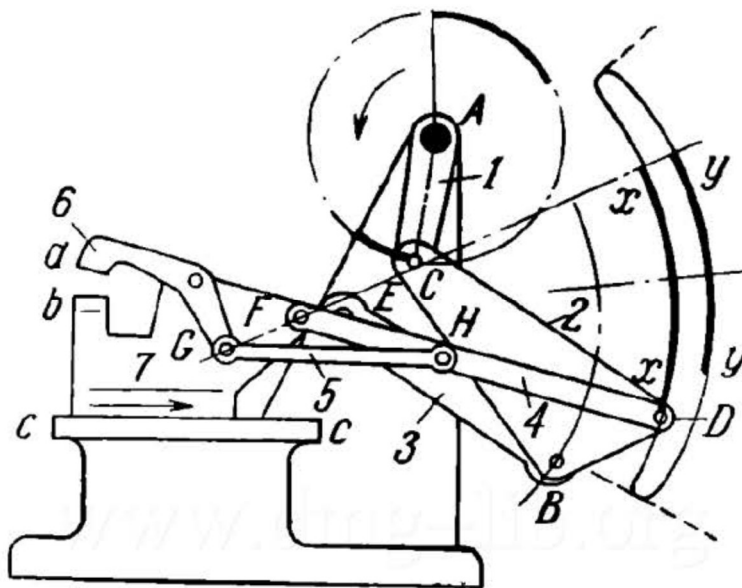
Trace the trajectory of two points in the opposite faces of the cutter (body 2) and table (which represent the cutting action) the trajectory of point F, shown in the figure.

806

MULTIPLE-BAR FEEDING MECHANISM

LW

SF



The lengths of the links comply with the conditions: $\overline{CB} = 2\overline{AC}$, $\overline{CD} = 2.4\overline{AC}$, $\overline{BD} = 0.9\overline{AC}$, $\overline{BE} = 2\overline{AC}$, $\overline{FD} = 3\overline{AC}$ and $\overline{AE} = 1.6\overline{AC}$. Sliding member 7 is reciprocated along guide $c-c$ by link 4 which is connected by turning pair D to connecting rod 2. Sliding member 7 has two dwells when point D is on portions $x-x$ and $y-y$ of its path, since these portions approximate circular arcs described from the corresponding positions of point E . Link 5 actuates link 6 for periodically clamping and unclamping the workpiece (or stock) between jaws a and b .

Required:

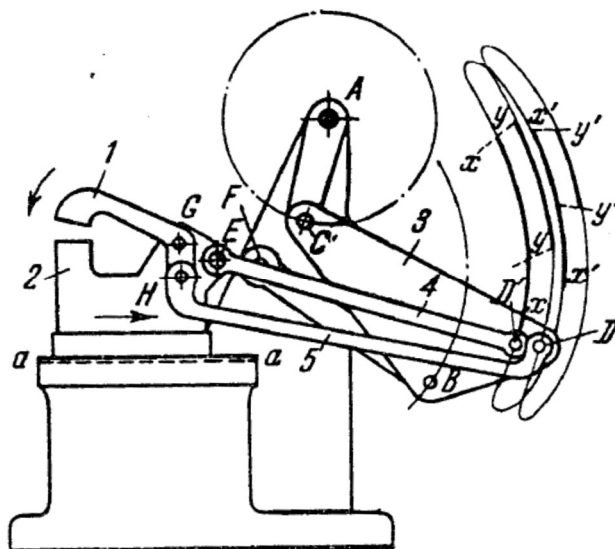
Trace the trajectory of points a and b , of the opposite faces of the gripper (which represent the gripping action) and of point D , shown in the figure.

1644

SLIDER-CRANK GRIPPING AND FEEDING
MECHANISM

SC

GC



The lengths of the links comply with the conditions: $\overline{BC} = 2\overline{AC}$, $\overline{BD'} = 0.9\overline{AC}$, $\overline{BD} = 1.1\overline{AC}$, $\overline{CD} = 2.55\overline{AC}$, $\overline{CD'} = 2.32\overline{AC}$, $\overline{BF} = 2\overline{AC}$, $\overline{AF} = 1.6\overline{AC}$, $\overline{ED'} = 2.8\overline{AC}$, $\overline{HD} = 3.6\overline{AC}$ and $\overline{HG} = 0.35\overline{AC}$. Connecting rod 3 actuates links 4 and 5. Link 4 is connected by turning pair E to slider 2 which reciprocates along fixed guides a-a. Link 5 is connected by turning pair H to link 1 which turns about axis G of slider 2. Slider 2 has dwells during the periods of time while point D' travels along portions x-x and x'-x' of its path since these portions approximate circular arcs described from the corresponding positions of point E. The stock is gripped and held by link 1, and it is released and link 1 is kept open, during the periods of time while point D travels along portions y-y and along y'-y' of its path since these portions approximate circular arcs described from the corresponding positions of point H.

Required:

Trace the trajectory of two points in the opposite faces of the gripper (which represent the gripping action) and of point D, shown in the figure.