Deadline: February 28, 2024

(Dropbox file request: https://www.dropbox.com/request/sKn8oqcnCGzjdz6uKUzW)

Name:_____**Number:**_____

Write the vector loop closure for the mechanism presented in the figure and

(1) Develop and present the position constraint equations, the velocity constraint equations and the acceleration constraint equations and report them.

(2) Identify the Jacobian matrix and the right-hand-sides of the velocity and acceleration equations and report them.

(3) Build the preprocessor script and the kinematic evaluation function in Matlab and use the program developed in class to solve the kinematic analysis of the mechanical system for 2 revolutions of the crank, with a constant angular velocity of 2π rad/s, and answer the question associated to your mechanism. Report the script, the kinematic evaluation function and the requested results of the kinematic analysis.

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: MechanismNumber = StudentNumber – Integer(StudentNumber/4)x4 + 1.

Example for Student number 023457 → MechanismNumber = 023457-5864x4+1= 2
Note that Integer(StudentNumber/4) is the integer obtained by truncation of the real number. In `Matlab` just calculate the mechanism number using:

```
MechanismNumber = StudentNumber – floor(StudentNumber/4)*4+1;
```
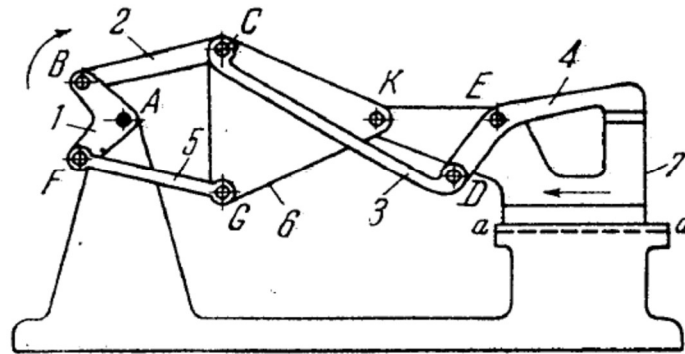
	SLIDER-CRANK GRIPPING AND FEEDING MECHANISM'	SC
1641		GC

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.
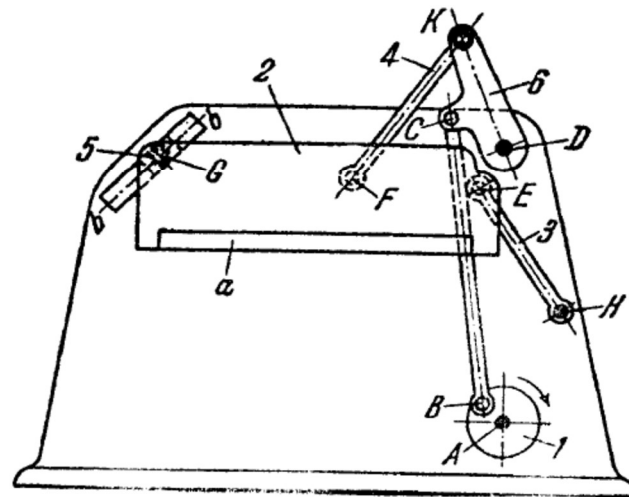
572

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.

Mechanism Number 2

| 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 slider *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.
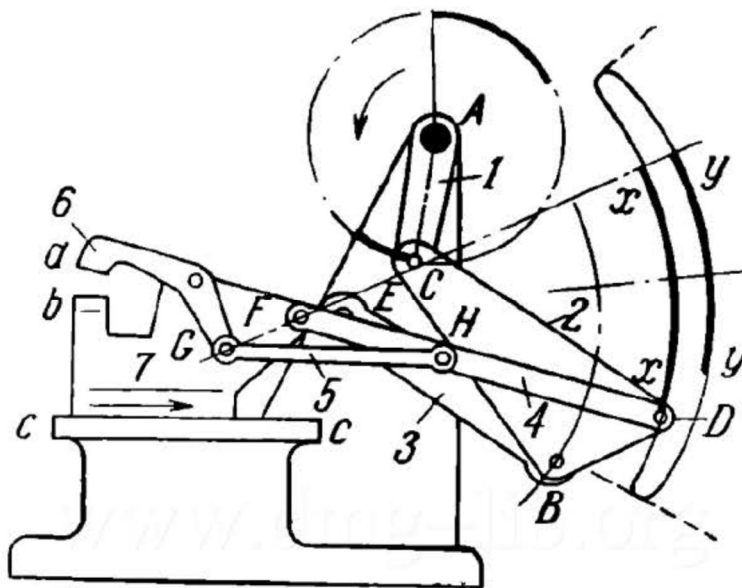
5

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.

Mechanism Number 3

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*.
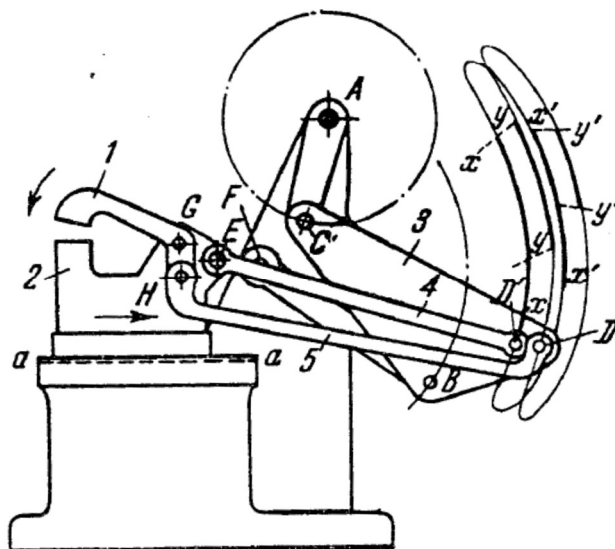
Required:

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.