



## NAMAL UNIVERSITY, MIANWALI

Department of Electrical Engineering

EE-254– Engineering Drawing

Lab – 6

### Introduction to Editing tools of AutoCAD 2022

Student Name	Institute ID	Marks
Fahim Ur Rehman Shah	NIM-BSEE-2021-24	

Date: 16-May-2023

Instructor: Engr. Rizwan Shabbir

#### Document History

Rev.	Date	Comment	Author
1.0	02-2022	Initial Draft	MB
1.1	04-2023	Revision	RS

## **Course Learning Outcomes**

CLO1: Ability to read basic engineering drawings problems.

CLO3: Reproduce 2-D and 3-D sketches using AutoCAD by applying engineering drawing principles.

## **Equipment**

- Software
  - AutoCAD 2016 Educational Version

## **Instructions**

The following instructions are to be followed while performing the labs:

- The manual must be thoroughly read before starting the lab.
- The theoretical concepts related to the lab and experiments must be revised.
- All attempts shall be made to complete the lab during the lab session.
- Any attempt to plagiarize from any source will be reported to the disciplinary committee for further action, so keep the work original.

## Objectives

- To get hands on experience of AutoCAD software.

## Background Information

Basic drawing tools are used to create some simple drawings. However, to create complex drawings, various editing operations are required to perform. The tools to perform the editing operations are available in the Modify panel on the home ribbon. Using these editing tools, existing objects are modified or use existing objects to create new or similar objects.



## Move tool

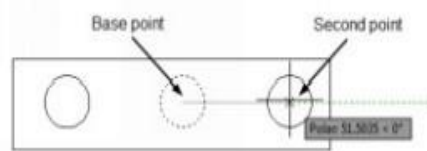
The Move tool moves a selected object(s) from one location to a new location without changing its orientation. To move objects, you must activate this tool and select the objects from the graphics window. After selecting objects, you must define the 'base point' and the 'destination point'.

## Example:

Create the drawing as shown below.



Click **Home > Modify > Move** on the ribbon or enter **M** in the command line. Click on the circle located at the right-side, and then right-click to accept the selection. Select the center of the circle as the base point. Make sure that the **Ortho Mode** is activated. Move the pointer toward right and pick a point as shown below. This moves the circle to the new location.



## The Copy tool

The Copy tool is used to copy objects and place them at a required location. This tool is similar to the Move tool, except that the object will remain at its original position and a copy of it will be placed at the new location.

## Rotate Tool

The Rotate tool rotates an object or a group of objects about a base point.

## Scale Tool

The Scale tool changes the size of objects. It reduces or enlarges the size without changing the shape of an object.

## Trim Tool

When an object intersects with another object, you can remove its unwanted portion by using the **Trim** tool. If there are multiple intersection points in a drawing, then it simply selects the select all option from the command line; all the objects in the drawing objects will act as 'cutting edges.

- Click **Home > Modify > Trim** on the ribbon or enter **TR** in the command line. Now, you must select the cutting edges.
- Press ENTER to select all the objects as cutting edges. Now, you must select the objects to be trimmed.

## The Extend tool

The Extend tool is similar to the Trim tool but its use is opposite of it. This tool is used to extend lines, arcs and other open entities to connect to other objects. To do so, you must select the boundary up to which you want to extend the objects, and then select the objects to be extended.

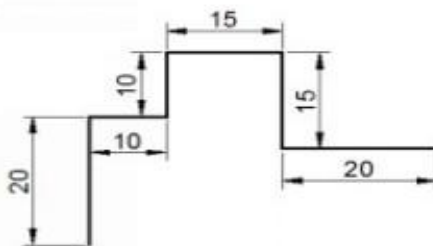
- Start a new drawing.
- Create a sketch using the Line tool.
- Click **Home > Modify > Extend** on the ribbon or enter **EX** in the command line.
- Select the vertical line as the boundary edge. Next, right-click.
- Select the horizontal open line. This will extend the line up to the boundary edge.

## Fillet Tool

The Fillet tool converts the sharp corners into round corners. It is required to define the radius and select the objects forming a corner.

You must define the radius and select the objects forming a corner.

- Start a new drawing.
- Type **Limmax** in the command line and press **ENTER**.
- Set the maximum limit to 100,100 and press **ENTER**.
- Click Zoom All on the Navigation Bar.
- Click Home > Draw > Polyline on the ribbon.
- Define the start point as 20, 50.
- Draw the lines as shown below



- Right-click and select **Enter**.
- Click **Home > Modify > Fillet** on the ribbon or enter **F** in the command line.
- Select the **Radius** option from the command line.
- Type 5 and press **ENTER**.

- Select the vertical line and the horizontal line as shown below.
- Notice that a fillet is created.



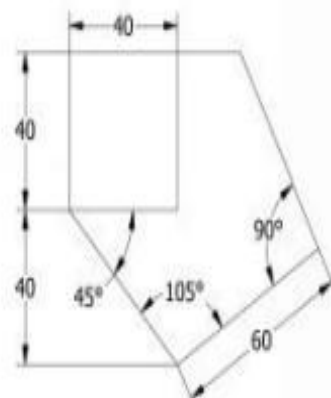
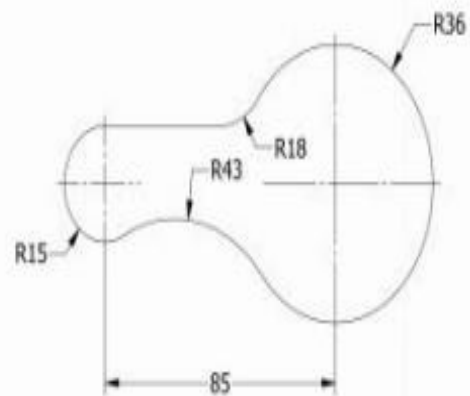
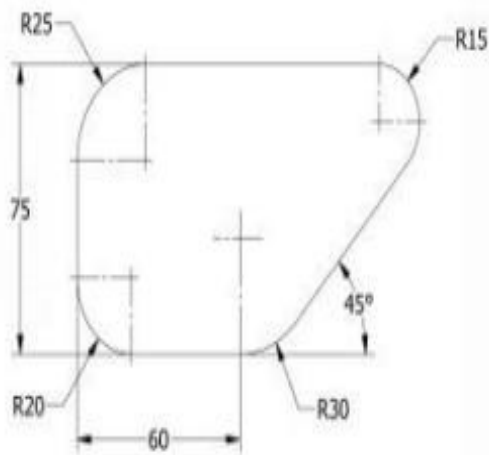
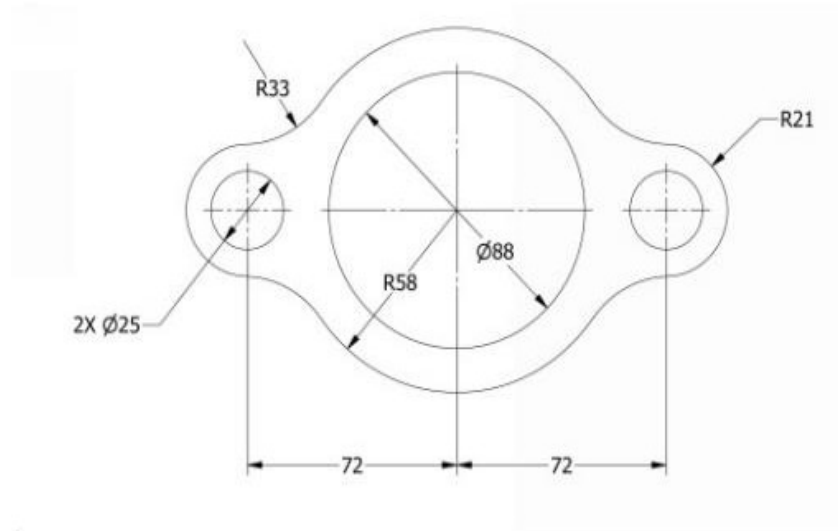
## The Chamfer tool

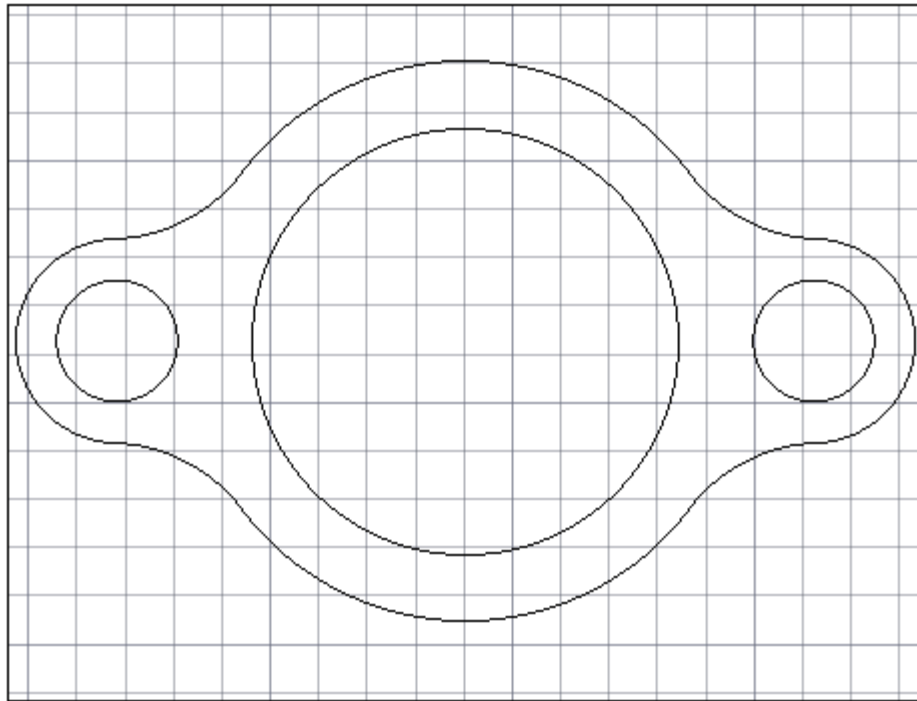
The **Chamfer** tool replaces the sharp corners with an angled line. This tool is similar to the **Fillet** tool, except that an angled line is placed at the corners instead of rounds.

- Click **Home > Modify > Fillet > Chamfer** on the ribbon or enter **CHA** in the command line.
- Follow the prompt sequence given next: Select first line or [Undo/Polyline/Distance/Angle/Trim/Method/Multiple]:
- Select the Distance option from the command line.
- Define first chamfer distance: Enter 8 as the first chamfer distance and press ENTER.
- Define second chamfer distance: Press **ENTER** to accept 8 as the second chamfer distance.
- Select first line or [Undo/Polyline/Distance/Angle/Trim/Method/Multiple]: Select the vertical line on the right-side.
- Select second line or shift-select to apply corner or [Distance/Angle/Method]: Select the horizontal line connected to the vertical line.

**Task:**

Draw the drawing as shown below. Also, write the procedure aided with the command sequence.



**Task 1 :****Procedure:**

- Draw two circles with same center one of the diameter of 88 units and other of radius 58 units
- Draw line of 72 units on both sides of the drawn circle center
- Draw two circles one of the diameter 25 units and another of the radius 21 units on the ends of each drawn line
- Fillet the outside circles with radius 33 units at every side
- Trim the unwanted parts from the diagram

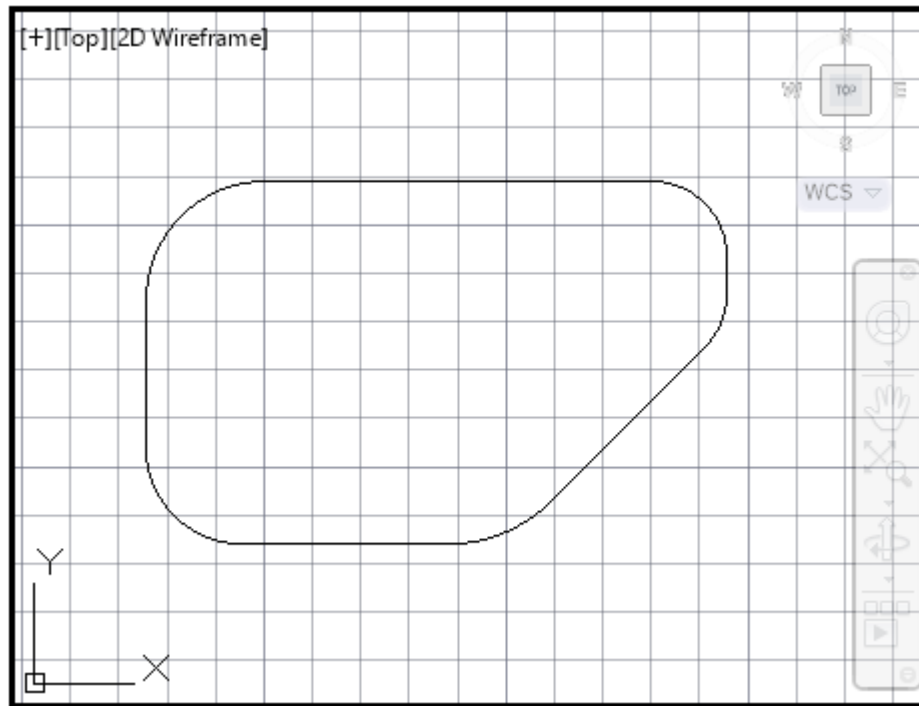
**Commands :**

Command: c CIRCLE Specify center point for circle or [3P/2P/Ttr (tan tan radius)]: r Point or option keyword required. Specify center point for circle or [3P/2P/Ttr (tan tan radius)]: Specify radius of circle or [Diameter]: 58 Command: Press ESC or ENTER to exit, or right-click to display shortcut menu. Command: C CIRCLE	Specify base point or [Displacement/mOde] <Displacement>: Specify second point or [Array] <use first point as displacement>: *Cancel* Command: l LINE Specify first point: Specify next point or [Undo]: 72 Specify next point or [Undo]: `*Cancel*` Command: c*Cancel* Command: *Cancel* Command: C CIRCLE	Select objects: 1 found Select objects: 1 found, 2 total Select objects: Current settings: Copy mode = Multiple Specify base point or [Displacement/mOde] <Displacement>: Specify second point or [Array] <use first point as displacement>: *Cancel* Command: MI MIRROR Select objects: Specify opposite corner: 0 found Select objects: 1 found Select objects: 1 found, 2 total
---	---	--

[illegible]



## Task 2:



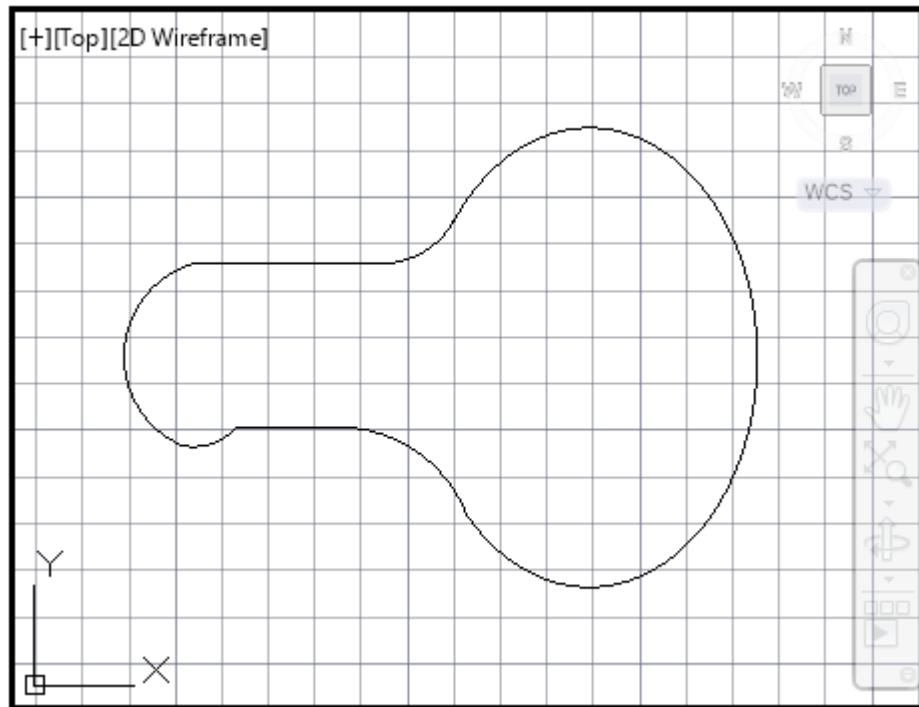
### Procedure:

- Draw a rectangle of length 120 units and width 75 units
- Fillet the top left and bottom left corner with radius 25 units and 20 units respectively
- Chamfer the bottom right corner with angle 45 degree
- Fillet the top right and bottom right corner with radius 15 and 30 units respectively
- Trim the unwanted parts from the figure

### Commands:

Command: RE REGEN Regenerating model. Command: *Cancel* Command: REC RECTANG Specify first corner point or [Chamfer/Elevation/Fillet/Thickness/Width]: Specify other corner point or [Area/Dimensions/Rotation]: d Specify length for rectangles <10.0000>: 120 Specify width for rectangles <10.0000>: 75 Specify other corner point or [Area/Dimensions/Rotation]:	Select second object or shift-select to apply corner or [Radius]: Command: *Cancel* Command: FILLET Current settings: Mode = NOTRIM, Radius = 25.0000 Select first object or [Undo/Polyline/Radius/Trim/Multiple]: r Specify fillet radius <25.0000>: 20 Select first object or [Undo/Polyline/Radius/Trim/Multiple]: Select second object or shift-select to apply corner or [Radius]: Command: FILLET	Command: Specify opposite corner or [Fence/WPolygon/CPolygon]: *Cancel* Command: Press ESC or ENTER to exit, or right-click to display shortcut menu. Command: CHA CHAMFER (NOTRIM mode) Current chamfer Dist1 = 0.0000, Dist2 = 0.0000 Select first line or [Undo/Polyline/Distance/Angle/Trim/mMethod/Multiple]: a Specify chamfer length on the first line <0.0000>: 45 Specify chamfer angle from the first line <0>: 45
---	---	--

<p>Crossing Lasso Press Spacebar to cycle options Command: Press ESC or ENTER to exit, or right-click to display shortcut menu. Command: F FILLET Current settings: Mode = NOTRIM, Radius = 30.0000 Select first object or [Undo/Polyline/Radius/Trim/Multiple]: r Specify fillet radius &lt;30.0000&gt;: 15 Select first object or Select first object or [Undo/Polyline/Radius/Trim/Multiple]: r Specify fillet radius &lt;33.0000&gt;: 25 Select first object or [Undo/Polyline/Radius/Trim/Multiple]:  [Undo/Polyline/Radius/Trim/Multiple]: Select second object or shift-select to apply corner or [Radius]: Command: *Cancel* Command: TR TRIM Current settings: Projection=View, Edge=None, Mode=Quick Select object to trim or shift-select to extend or [cuTting edges/Crossing/mOde/Project/eRase]: Select object to trim or shift-select to extend or [cuTting edges/Crossing/mOde/Project/eRase/Undo]: Specify next fence point or [Undo]: Specify next fence point or [Undo]: Select object to trim or shift-select to extend or</p>	<p>[cuTting edges/Crossing/mOde/Project/eRase/Undo]: Select object to trim or shift-select to extend or [cuTting edges/Crossing/mOde/Project/eRase/Undo]: Select object to trim or shift-select to extend or Command: *Cancel* Select first object or [Undo/Polyline/Radius/Trim/Multiple]: Select second object or shift-select to apply corner or [Radius]: Select second object or shift-select to apply corner or [Radius]: Command: *Cancel* Command: CH PROPERTIES [cuTting edges/Crossing/mOde/Project/eRase/Undo]: Select object to trim or shift-select to extend or [cuTting edges/Crossing/mOde/Project/eRase/Undo]: Select object to trim or shift-select to extend or [cuTting edges/Crossing/mOde/Project/eRase/Undo]: Select object to trim or shift-select to extend or [cuTting edges/Crossing/mOde/Project/eRase/Undo]: Select object to trim or shift-select to extend or</p>	<p>Command: &lt;Switching to: Layout1&gt; Regenerating layout. Regenerating model - caching viewports. Command: Specify opposite corner or [Fence/WPolygon/CPolygon]: *Cancel* Command: _MSPACE Command: Press ESC or ENTER to exit, or right-click to display shortcut menu.</p>
--	--	---

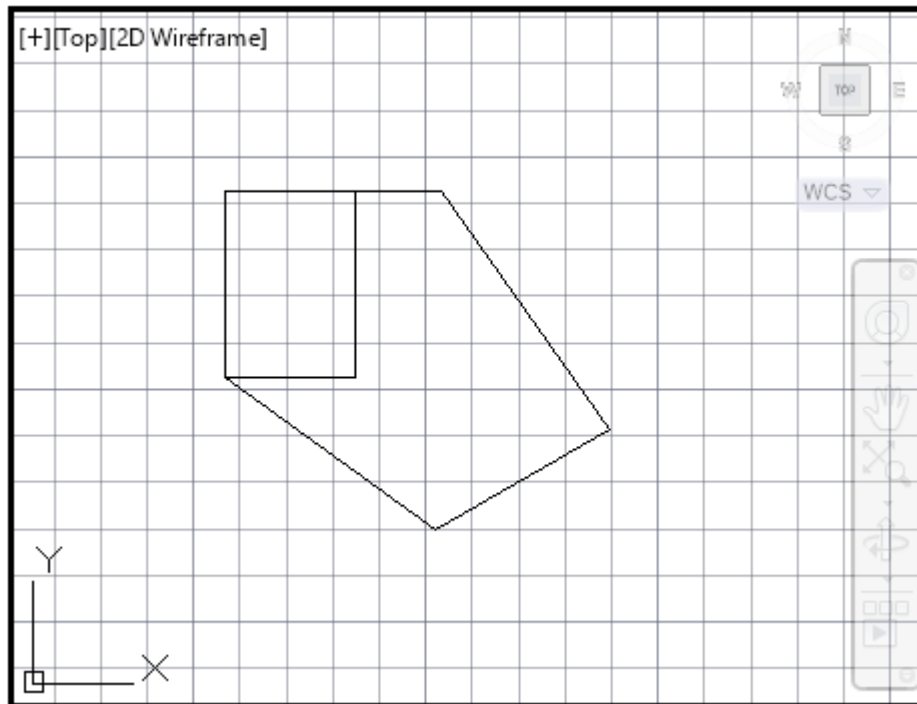
**Task 3:****Procedure:**

- Draw a line of line of 85 units
- Draw a polygon of 36 units at right and 15 units at left
- Offset the line with distance 20 on both sides
- Fillet the both the polygon with the line
- Trim the unwanted parts from the diagram

**Commands:**

Command: l LINE Specify first point: 85 Specify next point or [Undo]: Specify next point or [Undo]: *Cancel* Command: LINE Specify first point: Specify next point or [Undo]: 85 Specify next point or [Undo]: *Cancel* Command: o OFFSET Current settings: Erase source=No Layer=Source OFFSETGAPTYPE=0 Specify offset distance or [Through/Erase/Layer] <Through>: 20	Command: _arc Specify start point of arc or [Center]: Specify second point of arc or [Center/End]: _e Specify end point of arc: Specify center point of arc (hold Ctrl to switch direction) or [Angle/Direction/Radius]: _a Specify included angle (hold Ctrl to switch direction): 15 Command: Command: ** STRETCH ** Specify stretch point or [Base point/Copy/Undo/eXit]:	FILLET Current settings: Mode = NOTRIM, Radius = 15.0000 Select first object or [Undo/Polyline/Radius/Trim/Multiple]: r Specify fillet radius <15.0000>: 18 Select first object or [Undo/Polyline/Radius/Trim/Multiple]: Select second object or shift-select to apply corner or [Radius]: Command: Command: ** STRETCH ** Specify stretch point or [Base point/Copy/Undo/eXit]:
---	--	--

<p>Select object to offset or [Exit/Undo]  Command:  <b>** STRETCH **</b>  Specify stretch point or [Base point/Copy/Undo/eXit]: *Cancel*  Command: Specify opposite corner or [Fence/WPolygon/CPolygon]: *Cancel*  Command: f  FILLET  Current settings: Mode = NOTRIM, Radius = 15.0000  Select first object or [Undo/Polyline/Radius/Trim/Multiple]: r  Specify fillet radius &lt;15.0000&gt;: 18  Select first object or [Undo/Polyline/Radius/Trim/Multiple]:  Select second object or shift-select to apply corner or [Radius]:  Command: L  LINE  Specify first point:  Specify next point or [Undo]:  Specify next point or [Undo]: *Cancel*  Command: FILLET  Current settings: Mode = NOTRIM, Radius = 18.0000  Select first object or  No valid fillet with radius 43.0000  Select second object or shift-select to apply corner or [Radius]:  Command:  Command: _pline  Specify start point:  Current line-width is 0.0000  [CUtting edges/Crossing/mOde/Project/eRase/Undo]:  Select object to trim or shift-select to extend or  Select object to trim or shift-select to extend or  <b>** STRETCH **</b>  Specify stretch point or [Base point/Copy/Undo/eXit]:  Command: *Cancel*  Command: TR  TRIM  Current settings: Projection=View, Edge=None, Mode=Quick</p>	<p>Command: *Cancel*  Command:  Press ESC or ENTER to exit, or right-click to display shortcut menu.  Command: c  CIRCLE  Specify center point for circle or [3P/2P/Ttr (tan tan radius)]:  Specify radius of circle or [Diameter]:  Command: F  Specify next point or [Arc/Close/Halfwidth/Length/Undo/Width]:  Command:  <b>** STRETCH **</b>  Specify stretch point or [Base point/Copy/Undo/eXit]:  Command: Specify opposite corner or [Fence/WPolygon/CPolygon]: *Cancel*  Command: *Cancel*  Command: FILLET  Current settings: Mode = NOTRIM, Radius = 43.0000  Select first object or [Undo/Polyline/Radius/Trim/Multiple]: r  Specify fillet radius &lt;43.0000&gt;: 43  Select first object or [Undo/Polyline/Radius/Trim/Multiple]:  Select second object or shift-select to apply corner or [Radius]:  TRIM  Current settings: Projection=View, Edge=None, Mode=Quick  Select object to trim or shift-select to extend or  [CUtting edges/Crossing/mOde/Project/eRase/Undo]: *Cancel*  Command:  Press ESC or ENTER to exit, or right-click to display shortcut menu.  Command: *Cancel*  Command: &lt;Switching to: Layout1&gt;  Restoring cached viewports -  Regenerating layout.</p>	<p>Command: *Cancel*  Command: _u Grip Edit  Command: _u FILLET  Command: _u INTELLIZOOM  INTELLIZOOM  Crossing Lasso Press Spacebar to cycle options  Press ESC or ENTER to exit, or right-click to display shortcut menu.  <b>** STRETCH **</b>  Specify next point or [Arc/Halfwidth/Length/Undo/Width]:  &lt;Ortho off&gt;  Specify next point or [Arc/Close/Halfwidth/Length/Undo/Width]:  Specify stretch point or [Base point/Copy/Undo/eXit]:  Command:  <b>** STRETCH **</b>  Specify stretch point or [Base point/Copy/Undo/eXit]:  Command: Specify opposite corner or [Fence/WPolygon/CPolygon]: *Cancel*  Command: *Cancel*  Command: TR  TRIM  Current settings: Projection=View, Edge=None, Mode=Quick  Select object to trim or shift-select to extend or  [CUtting edges/Crossing/mOde/Project/eRase/Undo]:  Select object to trim or shift-select to extend or  Select object to trim or shift-select to extend or  [CUtting edges/Crossing/mOde/Project/eRase/Undo]:  [CUtting edges/Crossing/mOde/Project/eRase/Undo]: *Cancel*  Command:  Command:  <b>** STRETCH **</b>  Specify stretch point or [Base point/Copy/Undo/eXit]:</p>
---	---	--

**Task 4:****Procedure:**

- Draw two lines of 40 , 40 units perpendicularly
- Draw line of 40 with angle of 45 degree at bottom line
- Draw another line of 60 units with angle of 105 degree
- Draw perpendicular line to the previous line and join to the first line

**Commands:**

Command: l LINE Specify first point: Specify next point or [Undo]: 40 Specify next point or [Undo]: *Cancel* Command: LINE Specify first point: Specify next point or [Undo]: 40 Specify next point or [Undo]: <Polar on> 40	Select object to trim or shift-select to extend or [cuTting edges/Crossing/mOde/Project/eRase]: Select object to trim or shift-select to extend or [cuTting edges/Crossing/mOde/Project/eRase/Undo]: *Cancel* Command: o OFFSET Current settings: Erase source=No Layer=Source OFFSETGAPTYPE=0	** STRETCH ** Specify stretch point or [Base point/Copy/Undo/eXit]: <Polar on> Command: *Cancel* Command: Command: Specify stretch point or [Base point/Copy/Undo/eXit]: Command: *Cancel* Command: Command: ** STRETCH ** Specify stretch point or [Base point/Copy/Undo/eXit]:
--	--	---

<p>Specify next point or [Close/Undo]: 60</p> <p>Specify next point or [Close/Undo]: &lt;Ortho on&gt; &lt;Ortho off&gt; &lt;Polar on&gt;</p> <p>Specify next point or [Close/Undo]:</p> <p>Specify next point or [Close/Undo]: *Cancel*</p> <p>Command:</p> <p>Command:</p> <p>** STRETCH **</p> <p>Specify stretch point or [Base point/Copy/Undo/eXit]: &lt;Ortho on&gt; *Cancel*</p> <p>Command:</p> <p>** STRETCH **</p> <p>Specify stretch point or [Base point/Copy/Undo/eXit]:</p> <p>Command: *Cancel*</p> <p>Command: tr</p> <p>TRIM</p> <p>Current settings: Projection=View, Edge=None, Mode=Quick</p> <p>** STRETCH **</p> <p>Specify stretch point or [Base point/Copy/Undo/eXit]:</p> <p>Command: *Cancel*</p> <p>Command:</p> <p>** STRETCH **</p> <p>Specify stretch point or [Base point/Copy/Undo/eXit]:</p> <p>Command: Specify opposite corner or [Fence/WPolygon/CPolygon]: *Cancel*</p> <p>Command:</p> <p>** STRETCH **</p> <p>Specify stretch point or [Base point/Copy/Undo/eXit]:</p> <p>Command:</p>	<p>Specify offset distance or [Through/Erase/Layer] &lt;Through&gt;: 40</p> <p>Select object to offset or [Exit/Undo] &lt;Exit&gt;:</p> <p>Specify point on side to offset or [Exit/Multiple/Undo] &lt;Exit&gt;:</p> <p>Select object to offset or [Exit/Undo] &lt;Exit&gt;:</p> <p>*Cancel*</p> <p>Command: l</p> <p>LINE</p> <p>Specify first point:</p> <p>Specify next point or [Undo]:</p> <p>Specify next point or [Undo]: *Cancel*</p> <p>Command:</p> <p>Press ESC or ENTER to exit, or right-click to display shortcut menu.</p> <p>Command:</p> <p>Command:</p> <p>[cuTting edges/Crossing/mOde/Project/eRase/Undo]:</p> <p>Select object to trim or shift-select to extend or</p> <p>[cuTting edges/Crossing/mOde/Project/eRase/Undo]:</p> <p>*Cancel*</p> <p>Command:</p> <p>Command:</p> <p>** STRETCH **</p> <p>Specify stretch point or [Base point/Copy/Undo/eXit]:</p> <p>Command: *Cancel*</p> <p>Command: &lt;Switching to: Layout1&gt;</p> <p>Restoring cached viewports - Regenerating layout.</p> <p>Regenerating 8 modified entities.</p> <p>Command: Specify opposite corner or [Fence/WPolygon/CPolygon]:</p> <p>Command:</p> <p>Press ESC or ENTER to exit, or right-click to display shortcut menu.</p> <p>Command:</p> <p>Automatic save to</p>	<p>Command: *Cancel*</p> <p>Command:</p> <p>Press ESC or ENTER to exit, or right-click to display shortcut menu.</p> <p>Command: *Cancel*</p> <p>Specify stretch point or [Base point/Copy/Undo/eXit]:</p> <p>Command: *Cancel*</p> <p>Command: tr</p> <p>TRIM</p> <p>Current settings: Projection=View, Edge=None, Mode=Quick</p> <p>Select object to trim or shift-select to extend or</p> <p>[cuTting edges/Crossing/mOde/Project/eRase]:</p> <p>Select object to trim or shift-select to extend or</p> <p>[cuTting edges/Crossing/mOde/Project/eRase/Undo]:</p> <p>Select object to trim or shift-select to extend or</p> <p>C:\Users\fahim\AppData\Local\Temp\lab 06_1_18050_64aefc06.sv\$ ...</p>
---	---	---

**Engineering Drawing Lab 06****Method of Evaluation:** Lab Report and in-lab marking by instructors.**Measured Learning Outcomes****CLO1:** Ability to read basic engineering drawings problems.**CLO3:** Reproduce 2-D and 3-D sketches using AutoCAD by applying engineering drawing principles.

	Excellent (10)	Good (9 to 7)	Satisfactory (6 to 4)	Unsatisfactory (3 to 1)	Poor (0)	Marks Obtained
Assignment (CLO1)	Required document filled-in neatly with meaningful answers to all questions, proper grammar and punctuations with proper conclusion drawn	Required document filled-in neatly with meaningful answers to most questions and proper conclusions drawn with some grammar mistakes	Some correct/meaningful answers and conclusions with some irrelevant ones. Some parts of the document not neat or some grammar mistakes.	Answers not understandable/ not relevant to questions. Conclusions not based on results. Illegible writing with no proper grammar/punctuation	Report/Hand out Not submitted	
Task Completion (CLO3)	All Tasks were completed successfully in the time of the lab	Most of the tasks were completed in the given time of the lab	Some of the tasks were completed in the given lab time	Very few tasks were performed and completed in given lab time	Lab tasks weren't performed at all	
Total						