UTA026 Manufacturing Processes
Work sheet

1. Browse the YouTube link given below and watch the video carefully.

   https://www.youtube.com/watch?v=Q5paWn7bFg4

   Do an internet search to make

   (a) a list of raw materials that are needed to manufacture the product shown in the above video.

   (b) a list of the processes involved to make this product, and briefly describe what happens in each of these processes (1-2 lines for each process).

2. The 60 mm diameter steel bar is to be turned down to 56 mm diameter on a standard lathe. The length of the bar to be turned is 250 mm and the tool has a pre-travel of 5 mm. If the machine produces 40 parts per hour find the cutting speed in m/min assuming the feed = 0.2 mm/rev. The depth of cut using an HSS tool cannot exceed 1 mm. Also calculate the Material Removal Rate.
3. The outside diameter of a cylinder made of titanium alloy is to be turned. The starting diameter = 500 mm and the length = 1000 mm. Cutting conditions are: feed, f = 0.4 mm/rev, and depth of cut, d = 3.0 mm. The cut will be made with a cemented carbide cutting tool whose Taylor tool life parameters are: n = 0.23 and C = 400. Units for the Taylor equation are minutes for tool life and m/min for cutting speed. Compute the cutting speed that will allow the tool life to be just equal to the cutting time for this part.
4. The 45 mm diameter steel bar is to be turned down to 28mm diameter on a standard lathe. The overall length of the bar is 475mm and the region to be turned is 420mm. Since you want to reduce the bar from 45 to 28mm, you have a total depth of cut, d of 8.5mm. You decide you want to make two cuts, a roughing pass and a finishing pass. Rough at d = 7.5mm using HSS tool at speed 30m/min and feed = 0.5mm/rev. For finish cut (d = 1mm), a coated carbide tool is used with speed = 280 m/min and feed = 0.18mm/rev. The bar is held in a chuck with a feed through the hole in the spindle and is supported on the right end with a live centre. The ends of the bar have been centre drilled. Allowance should be 12mm for approach (pre-travel). Allow 2.0 min to reset the tool after the first cut. Determine the inputs to the lathe and the total time required for machining the component.
5. Tool life of 75 min was obtained at a cutting speed of 25m/min and that of 10 min when cutting at 60 m/min. Establish the tool life equation and calculate the cutting speed for 5 minutes tool life.

6. A 0.50 m long annealed copper-alloy round bar is required to be rough turned on a lathe from a 60 mm diameter to a 55 mm diameter, using a HSS tool. While holding the bar on the lathe, 10% of its total length is used for gripping in the chuck and another 12.5 mm is left un-machined at the chuck side. An approach distance (tool pre-travel) of 7.5 mm is used during each pass for turning. The maximum cutting speed employed is 50 m/min, feed 0.4 mm/rev and maximum depth of cut per pass allowed is 1.0 mm. Estimate the total time required to complete the job assuming a set up change time of 2 mins after each pass.
7. The component of aluminium shown below is to be manufacture. A 50 mm diameter blank, 120 mm long, is to be used. Write a CNC part program for its manufacturing in CNC machine. Mark the work reference point in the picture and list down all the assumptions that have been taken during machining operation (such as depth of cut in turning, drilling etc.). Consider following parameters during machining:

   i. Tool pre-travel allowance is 2 mm.

   ii. Spindle speed during turning, drilling and threading operation are 2000, 1000 and 500 rpm, respectively.

   iii. Feed rate during roughing and finish operations in turning are 100 and 60 mm/min, respectively.

   iv. Feed rate in drilling is 60 mm/min.

   iii. The workpiece has to face of 2 mm before other operation.

   iv. The depth of cut during roughing and finishing operations are 0.5 and 0.1 mm, respectively.

   v. The DOC and tool retract distance in drilling are 0.5 and 1 mm, respectively.

   vi. The included angle of thread is 60°. No. of finishing passes are 4. Finishing allowance is 0.01mm. Minimum DOC for threading is 0.04 mm and depth of cut for first pass is 0.1 mm, respectively.

8. For a particular type of cutting tool used during rough machining of steel jobs the following are noted:

   Cutting speed 160 m/min gives tool life of 5.75 min and cutting speed 100 m/min gives tool life of 25 min. Establish the Taylor tool life equation. If the Taylor tool life index for finish machining reduces to 0.8 times the index calculated for rough machining, predict the tool life during the rough and finish cutting at a cutting speed of 60 m/min.

9. The overall size of the aluminium plate, 12 mm thick, is 100 × 100 mm. Write a manual part program for making slots of depth 2 mm and width 10 mm as shown below figure. Mark the work reference point in the picture and list down all the assumptions that have been taken during machining operation. Consider tool rotational speed and feed rate are 2500 rpm and 100 mm/min, respectively.