



First Semester Examination  
2021/2022 Academic Session

February/March 2022

**EPP201 – Manufacturing Technology I**

Duration : 3 hours

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Please check that this examination paper consists of SIX [6] printed pages before you begin the examination.

**INSTRUCTIONS** : Answer **ALL FIVE [5]** questions.

In the event of any discrepancies, the English version shall be used.

1. In the welding field, quality of the welding and safety issues have been debated by many researchers and technologists in recent years. The collapse and malfunction of certain structures, due to distortion in a weld resulting from the expansion and contraction of the weld metal and adjacent base metal during the heating and cooling cycle of the welding process has been the most common issue.
- [a] Justify the selection of materials and the welding process in joining two dissimilar metals based on your selection of end-products. (5 marks)
- [b] Analyse the testing that could be used in order to evaluate the quality of welding performed. (10 marks)
- [c] Evaluate FOUR (4) activities that could minimize the distortion in welding. (10 marks)
2. [a] An orthogonal cutting operation of a mild steel is conducted based on the conditions shown in Figure 1.

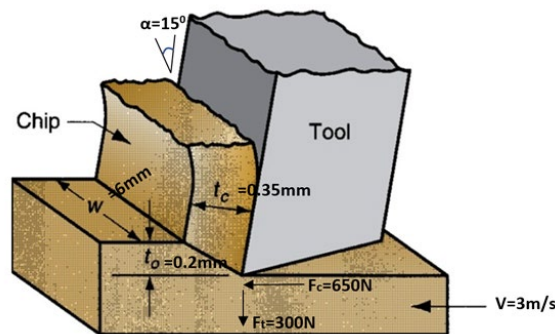


Figure 1

- (i) Find the percentage of power that is dissipated in the shear zone.
- (ii) Explain, using a force circle diagram, what will happen to the cutting force,  $F_c$ , friction force,  $F_t$ , and thrust force,  $F_t$  if coolant is applied to the above operation.
- (iii) Which cutting tool-material is appropriate if the above-mentioned cutting operation is interrupted? Please provide your justifications.

(60 Marks)

...3/-

- [b] Figure 2 below shows the drawing of a machining part made from stainless steel.

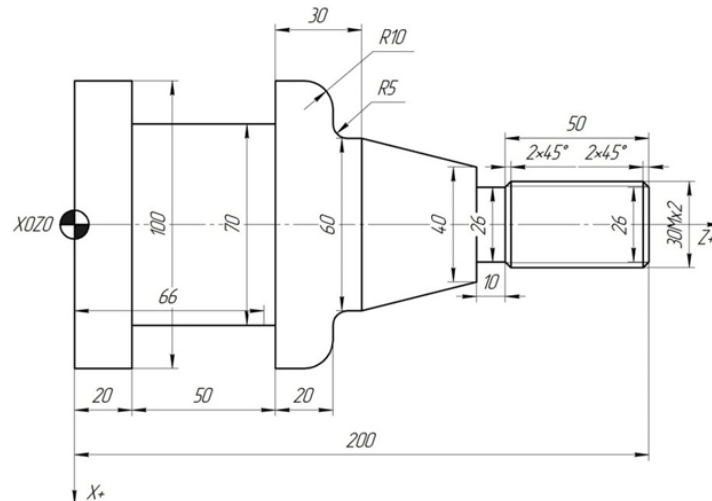


Figure 2

- (i) List out the appropriate machining operations, cutting tools and cutting tools materials needed to create the above part. Give justification for your material selection.
- (ii) Identify types of grinding processes needed on each of profile above.

(40 Marks)

3. [a] Briefly describe any THREE (3) material properties and their effect to the formability of an aluminum sheet stamping process.

(3 marks)

- [b] Figure 3 [ii] shows two curves of different materials. Relate the phenomenon of springback to the strength of the material and compare the springback formation between these two materials.

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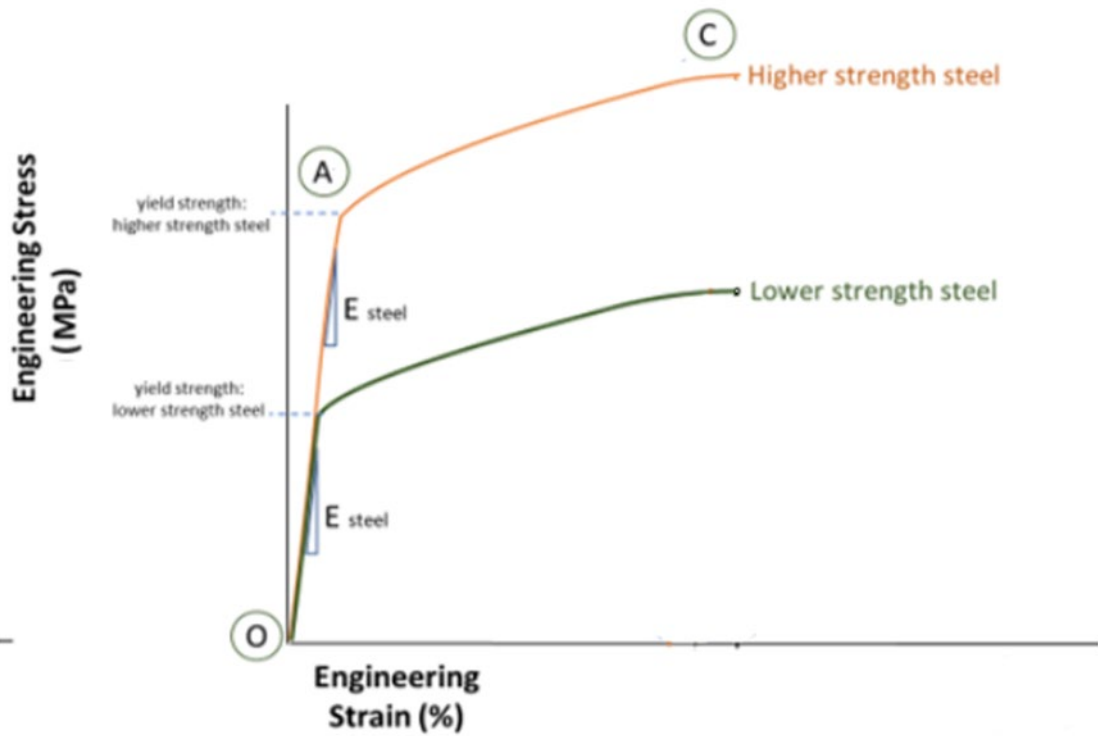


Figure 3[b]

(6 Marks)

- [c] Sketch a Forming Limit Curve (FLC) of two different materials and compare their forming behavior.

(1 Mark)

...5/-

4. [a] Typically railroad rails are made by shape rolling process. However, recently aluminum rail manufactured by extrusion process as shown in Figure 4[a] is now become an alternatives. Explain the advantages of extrusion process compared to shape rolling process from the environment perspective.

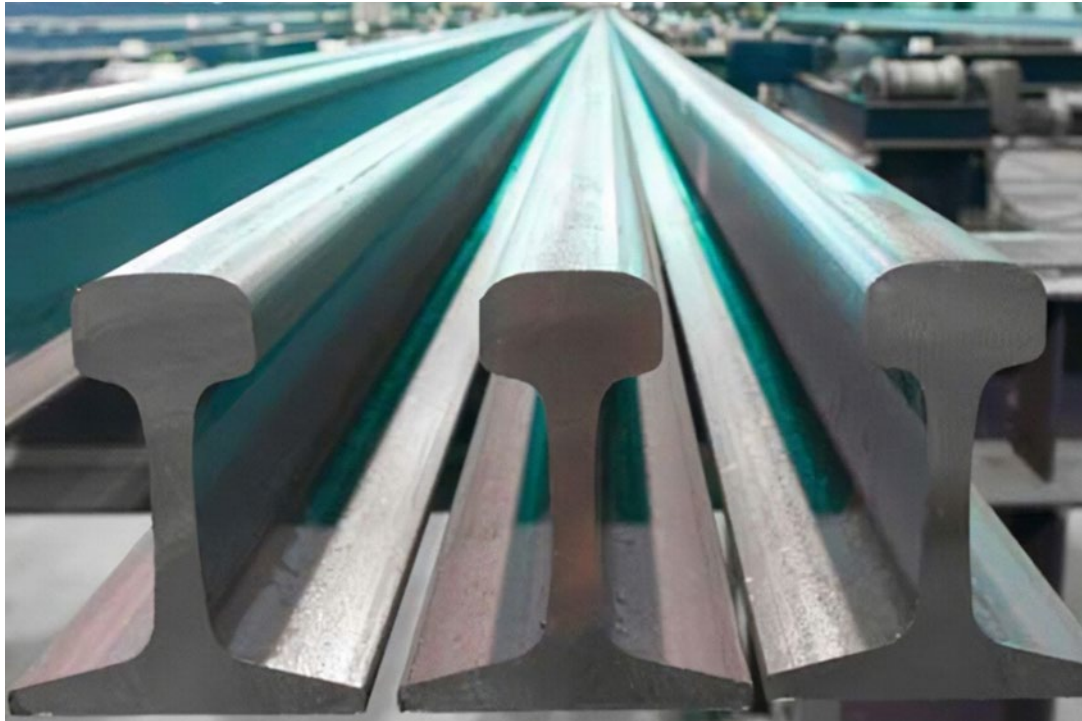


Figure 4[a]

**(3 marks)**

- [b] Suggest the most appropriate metal forming operations in order to produce the following products below. And support your answer.



- (i) Rivet

...6/-



(ii) Flange



(iii) Cable Lug

(3 marks)

[c] The metal forming industry is a broad field of applications. Excellent quality products, less operating cost, efficient machinery process, and less environmental impact are some of the strategies that need to be taken into considerations. Lubricants, for example, are widely used in hot forging operations to minimize product defects during metal deformation. To support the strategy, inform your top management about the green lubricants and its advantages compared to petroleum-based lubricants in the metal forming process.

(4 marks)

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