



First Semester Examination  
2022/2023 Academic Session

February 2023

**EPP 201 – Manufacturing Technology I**  
**(Teknologi Pembuatan I)**

Duration: 3 hours  
(Masa: 3 jam)

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Please check that this examination paper consists of SEVEN (7) pages of printed material before you begin the examination.

*[Sila pastikan bahawa kertas peperiksaan ini mengandungi TUJUH (7) muka surat yang bercetak sebelum anda memulakan peperiksaan ini].*

**Instructions** : Answer **ALL FIVE (5)** questions.

**Arahan** : Jawab **KESEMUA LIMA (5)** soalan.]

1. [a] State any FIVE (5) solid state welding techniques and any 5 (FIVE) fusion welding techniques.

**(20 marks)**

[b] Differentiate between Solid-state Welding and Fusion Welding in terms of 5 criteria; i) energy needed, ii) cost of the process, iii) joint edge preparation, iv) dissimilar material welding capability and v) requirement of secondary process.

**(60 marks)**

[c] One of the strategies for weight reduction in automotive part manufacturing is via tailor welded blank (TWB). Describe any TWO (2) advantages offered by the tailor welded blank for weight reduction.

**(20 marks)**

2. [a] Figure 2 (a) shown is the typical temperature distribution in the cutting zone during machining process. By redrawing the figure.

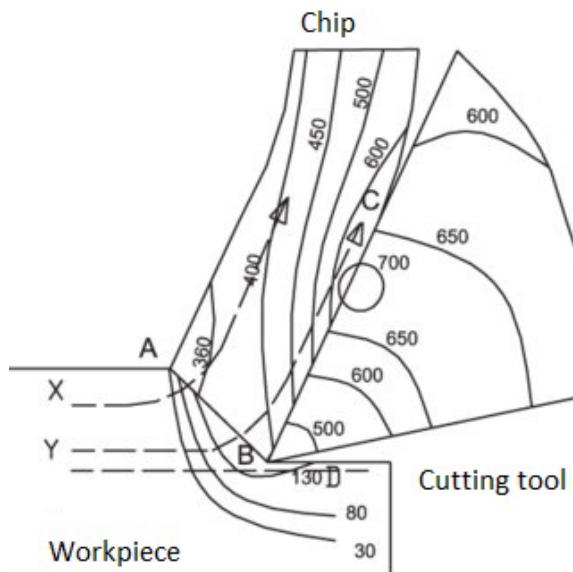


Figure 2 (a)

(i) Locate THREE (3) different wears/failures that would occur on cutting tool.

**(15 marks)**

...3/-

(ii) Identify THREE (3) wears/failures effect on overall machining economic and workpiece's quality.

**(15 marks)**

(iii) What is the percent increase in tool life if the cutting speed is reduced by (a)50% and (b) 75%? Let  $n = 0.5$  and  $C = 90$  in the Taylor equation ( $VT^n = C$ ) for tool wear.

**(20 marks)**

[b] Metal chips created during the machining process are often a great indicator of overall process conditions. Based on Figure 2 (b).



Figure 2 (b)

(i) List TWO (2) factors contributed to this chip formation.

**(20 marks)**

(ii) Explain in brief the chips formation mechanism.

**(30 marks)**

3. [a] Investment casting (Figure 3 (a)) is one of the oldest known metal-forming techniques and falls into the expendable mold casting category.

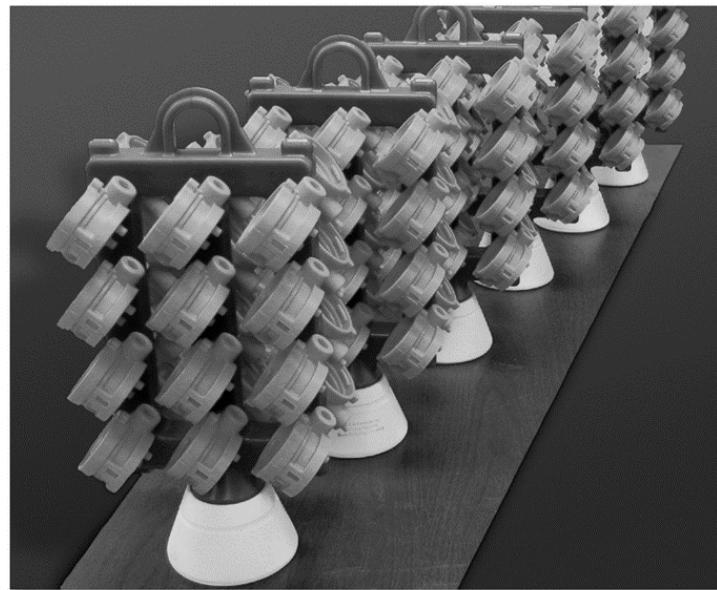


Figure 1 (a)

(i) Identify TWO (2) main benefits of investment casting over die casting. **(10 marks)**

(ii) Explain in detail step by step processes of investment casting to produce the above products. **(40 marks)**

[b] Different types of casting defects are shown in Figure 3 (b). To overcome those defects.

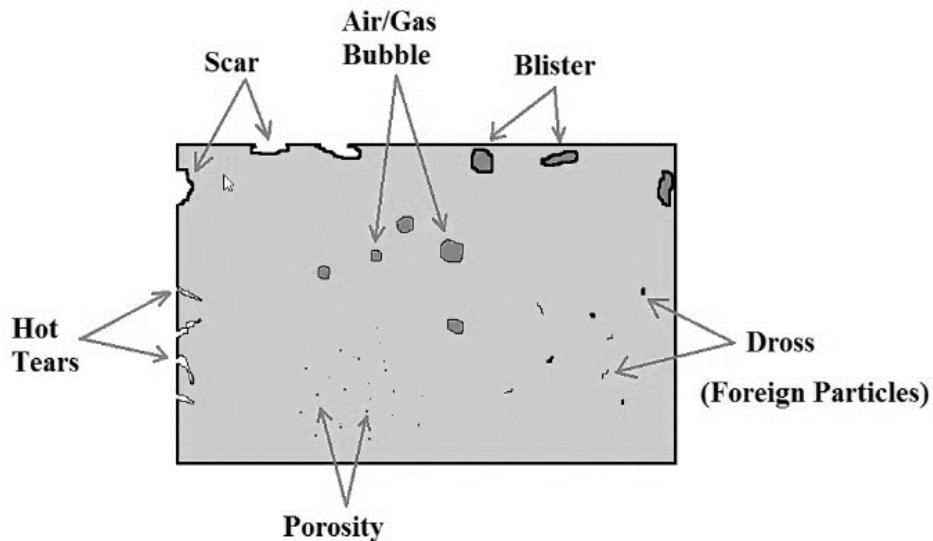


Figure 3 (b)

(i) Sketch a sand-casting mold which consists of drag and cope parts with its features (pouring cup, riser, blind and runner)

**(35 marks)**

(ii) Finishing process is needed after the casting process in order to improve the surface finish and accuracy of part being produced. Identify THREE (3) problems that might arise during the grinding process?

**(15 marks)**

4. [a] Name THREE (3) physical properties that may affect the performance of metal forming processes.

**(15 marks)**

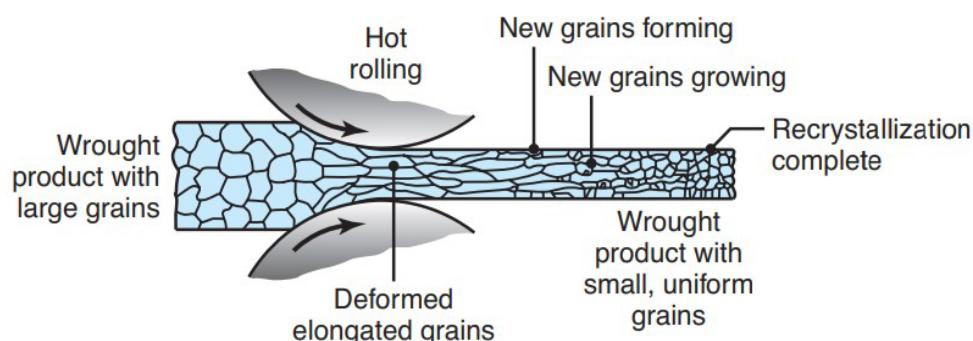
[b] Describe the effect of i) temperature, (ii) hardness and (iii) yield strength to the springback of the part given in Figure 4[b],

**Figure 4[b]****(45 marks)**

[c] A forming limit diagram (FLD) is very important information that presents the behavior of a material upon forming. Sketch the forming limit diagram (FLD) and discuss the effect of temperature on formability of a material.

**(40 marks)**

5. [a] Hot rolling is an effective way to reduce grain size in metals for improved strength and ductility. The changes in the grain structure of cast or large-grain wrought metals during hot rolling are illustrated in Figure 5[a]. Define the word recrystallization and briefly explain the recrystallization temperature.

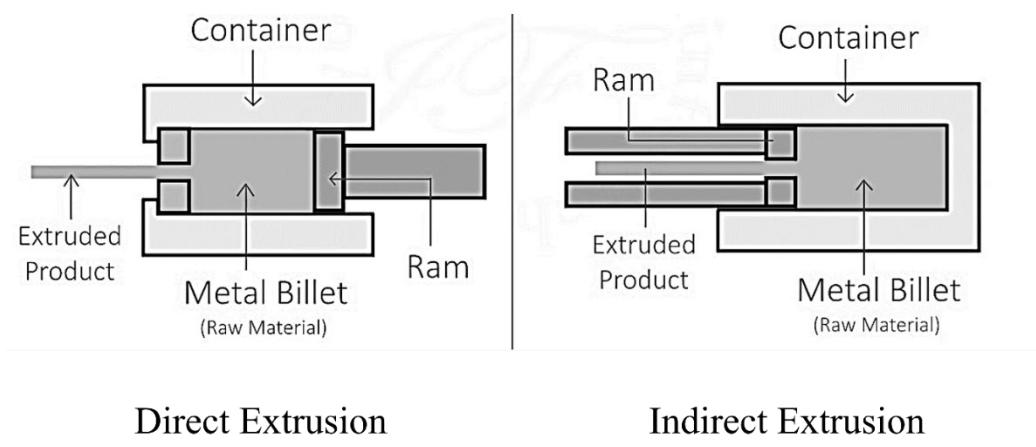
**Figure 5[a]****(20 marks)****...7/-**

[b] A crankshaft is the heart of an engine. It is used wherever energy and power are converted into rotary motion either in the car or aircraft engine system. Discuss TWO (2) trade-offs involved in selecting between the forged and cast crankshafts as in Figure 5[b]. Sketch the grain flow to support your selection.



**Figure 5[b]**  
**(40 marks)**

[c] In extrusion, usually a cylindrical billet is forced through a die in a manner similar to squeeze toothpaste from a tube. Figure 5[c] illustrated the direct extrusion and indirect extrusion. Briefly explain TWO (2) differences between these two processes.



**Figure 5[c]**  
**(40 marks)**

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