



UTHM

Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION SEMESTER II SESSION 2023/2024

- COURSE NAME : MANUFACTURING PROCESS
- COURSE CODE : DAM 23202
- PROGRAMME CODE : DAM
- EXAMINATION DATE : JULY 2024
- DURATION : 2 HOURS 30 MINUTES
- INSTRUCTIONS :
- PART A:
ANSWER **FOUR (4)** QUESTIONS ONLY.
 - PART B:
ANSWER **ONE (1)** QUESTION ONLY.
 - THIS FINAL EXAMINATION IS CONDUCTED VIA
 Open book
 Closed book
 - STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA **CLOSED BOOK**

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

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CONFIDENTIAL

PART A: ANSWER FOUR (4) QUESTIONS ONLY

- Q1** (a) Define the following classification of manufacturing processes and provide two (2) examples for each classification.
- (i) Shaping processes.
 - (ii) Property enhancing processes.
 - (iii) Surface processing operations.
 - (iv) Permanent joining process.
 - (v) Mechanical fastening.
- (10 marks)
- (b) Explain the difference between ferrous and nonferrous material in term of mechanical properties.
- (2 marks)
- (c) Steel is produced from iron and grouped into four categories, namely plain carbon steel, low alloy steel, stainless steel and tool steel. Discuss the difference among the four groups in term of material properties and their intended purposes.
- (8 marks)
- Q2** (a) Standard metal roll bar is produced in a length of 6 meter. Two of the possible methods to cut the metal roll are by using power hacksaw and band saw as in **Figure Q2.1**.

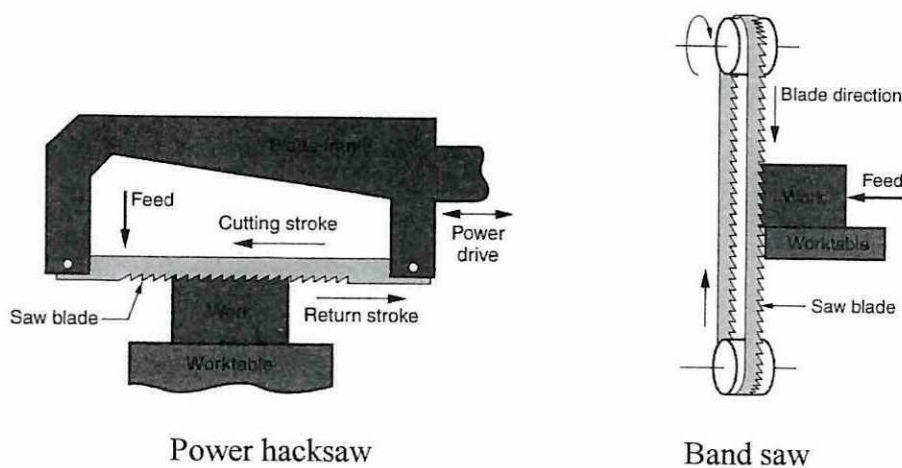


Figure Q2.1

- (i) Explain the working method of each of the saw.
- (2 marks)
- (ii) Discuss which method is more efficient in cutting the metal roll bar.
- (2 marks)

- (b) The material removal rate (MRR) for lathe machining is proportional to cutting speed (v), feed rate (f) and width of cut (w).
 - (i) Explain the term cutting speed (v), feed rate (f) and width of cut (w). (3 marks)
 - (ii) Discuss each of the term in improving the lathe machining performance. (3 marks)

- (c) One of the reasons to use expendable mold in metal casting process is its capability to produce complex shape casting part.
 - (i) Discuss why permanent mold cannot produce the complex shape part. (2 marks)
 - (ii) Sketch two (2) drawings of complex shape part. (2 marks)

- (d) Centrifugal casting is grouped into true centrifugal casting, semi-centrifugal casting and centrifuging casting.
 - (i) Define true centrifugal casting, semi-centrifugal casting and centrifuging casting. (3 marks)
 - (ii) Engine cylinder liner, sewage pipes, streetlamp post, pulley, nozzle and dental casting are the products of centrifugal casting. Match each of the product to true centrifugal casting, semi-centrifugal casting and centrifuging casting. (3 marks)

Q3 (a) Explain the sintering sequence of the metal powder in sintering cycle in **Figure Q3.1**.

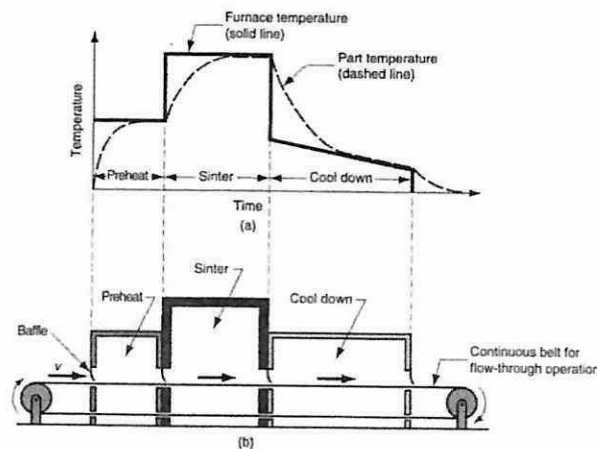


Figure Q3.1

(4 marks)

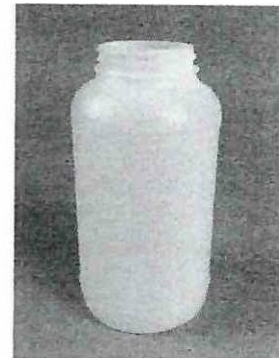
- (b) One of the main properties of powder metallurgy is that the porosity of the product is high.
 - (i) Explain how porosity can be an advantage for a powder metallurgy product. (3 marks)
 - (ii) Discuss the process and the reason to make the powder metallurgy product become nonporous. (3 marks)
- (c) Both metal and plastic materials can undergo extrusion process. Discuss difference in extrusion process between metal and plastic material. (4 marks)
- (d) Describe the process to produce the food container as illustrated in **Figure Q3.2**.



(a)



(b)



(c)

Figure Q3.2

- (i) Outer plastic part of travel luggage bag.
- (ii) Plastic bag.
- (iii) Plastic bottle container.

(6 marks)

- Q4** (a) Metal forming is classified as bulk deformation and sheet metalworking. Match the following metal forming process to either bulk deformation or sheet metalworking.
- (i) Bending.
 - (ii) Forging.
 - (iii) Extrusion.
 - (iv) Drawing.
- (4 marks)
- (b) The three types of forging are open-die forging, impression-die forging and flashless forging. With the aid of a sketch, explain each of the forging. (6 marks)

- (c) A bolt nut as in **Figure Q4.1** comprise of hexagon head shape at the top and thread at the bottom side.



Figure Q4.1

- (i) Discuss the forging process to make the hexagon head shape with reference to question Q4(a). (2 marks)
- (ii) Explain the process to the thread at the bottom side of the bolt nut. (2 marks)
- (d) Explain hot roll and cold roll metal steel. If you work in a construction, which type of metal would you use? Discuss your selection. (6 marks)

- Q5** (a) Washer is used with threaded fasteners to ensure the tightness of the mechanical joint. State three (3) types of washers and its function. (6 marks)

- (b) **Figure Q5.1** shows various material and the application. For each given material, suggest the welding or joining process that is suitable to the material and application. Give the reason for each suggestion.



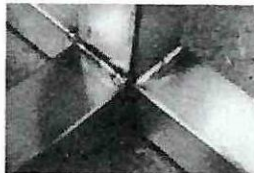
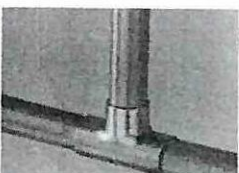
			
(i) High strength low alloy steel and car body	(ii) AISI 1050 steel and rail	(iii) SUS 304 stainless steel tube and furniture structure	(iv) Thin copper tube for air condition line

Figure Q5.1

(6 marks)

- (c) Non-Destructive Test (NDT) is widely used in manufacturing industries to verify the reliability of a product. Describe two (2) methods in which NDT is used to verify the reliability of welding. (4 marks)
- (d) As NDT equipment are expensive, describe other methods that can be used to verify the reliability of welding. (4 marks)

PART B: ANSWER ONE (1) QUESTION ONLY

- Q6** As you have gained expertise after working for several years in a company that produces wrenches, you are invited to share your expertise to a group of university students. The topic of the sharing is “How to produce a combination wrench” as in **Figure Q6.1**.



Figure Q6.1

- (a) Discuss the possible material used to produce the combination wrench. (2 marks)
- (b) Metal stamping, broaching, milling and forging are the processes required to produce the combination wrench.
- (i) Arrange in order the sequence to produce the combination wrench. (4 marks)
- (ii) Explain each process relating to the producing the combination wrench. (8 marks)
- (c) Explain additional process required to:
- (i) remove sharp edges due to cutting of material.
- (ii) improve strength of the combination wrench.
- (iii) avoid corrosion to the combination wrench. (6 marks)

Q7 You are asked by your employer to design a plastic mineral water bottle as in **Figure Q7.1**. The water bottle comprises of a bottle and a cap.



Figure Q7.1

- (a) The available materials are thermoplastic and thermosetting. Discuss the material that you choose to produce the bottle and the cap. (6 marks)
- (b) Discuss the type and location of the gate of injection moulding need to be placed on the cap. (4 marks)
- (c) The bottle can either be produced using extrusion blow moulding or injection blow moulding.
 - (i) Explain the process of each blow moulding. (8 marks)
 - (ii) Decide with reasoning, the blow moulding that you choose. (2 marks)

-END OF QUESTIONS -