Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2022/2023

COURSE NAME	:	MANUFACTURING PROCESS
COURSE CODE	:	DAM 23202 / DAM 32202
PROGRAMME CODE	:	DAM
EXAMINATION DATE	:	FEBRUARY 2023
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTIONS	:	1. PART A ANSWER **FOUR (4)** QUESTIONS ONLY. 2. PART B ANSWER **ONE (1)** QUESTION ONLY. 3. THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK.** 4. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK.

THIS QUESTION PAPER CONSISTS OF **EIGHT (8)** PAGES

PART A: ANSWER FOUR (4) QUESTIONS ONLY.

Q1 (a) Industries can be classified into **three**. Describe all **three (3)** classifications. (6 marks)

(b) A metal bar has a diameter of 100 mm with a tolerance of 0.1 mm. Write the dimension and the tolerance limit in:

i) bilateral dimension (1 mark)

ii) unilateral dimension (1 mark)

iii) limit dimension (1 mark)

(c) Distinguish between iron and steel. (4 marks)

(d) Describe the processes undergone by hematite (Fe_2O_3) to produce low carbon steel. (7 marks)

Q2 (a) Define traditional and nontraditional machining. State **two (2)** examples of nontraditional machining. (4 marks)

(b) A round metal bar was lathe machined in such the end product is as **Figure Q2(b)**. Enough force, F is applied to damage the product.

i) Draw the metal bar indicating the location of the damage. (1 mark)

ii) Explain the damage and reason for the damage (2 marks)

iii) Propose another manufacturing process to avoid this damage. (3 marks)

(c) Explain the **two (2)** categories of casting process. (4 marks)

(d) A sand casting mold is illustrated in **Figure Q2(c)**. The product can be improved by altering the dimension of downsprue, runner and riser. As a designer, explain your choice of dimension of the three parameters. (6 marks)

Q3 (a) Explain the production sequence in producing a product using powder metallurgy.

(4 marks)

(b) A spur gear can be produced using the process of machining, metal casting or powder metallurgy. Explain which method is:

i) the most economical

(2 marks)

ii) produce the highest efficiency of gear

(2 marks)

iii) the strongest gear when an external force is applied

(2 marks)

(c) In the metal pressing process, a metal sheet can be cut either using the principle of shearing, blanking and punching. Explain with an aid of a sketch the three cutting principles.

(6 marks)

(d) With an aid of a sketch, explain the difference between bending and drawing.

(4 marks)

Q4 (a) Define the following terms.

i) Strength

(1 mark)

ii) Hardness

(1 mark)

iii) Toughness

(1 mark)

iv) Ductility

(1 mark)

(b) A knife can be either be produced using hot or cold forging.

i) Describe hot and cold forging.

(2 marks)

ii) Explain the difference of strength between hot forged knife and cold forged knife with reference to Q4(a).

(4 marks)

(c) Describe thermoplastic and thermosetting material.

(4 marks)

(d) Describe the process to produce the food container as illustrated in **Figure Q4(d)**.

i) Polystyrene (PS) foam container

(2 marks)

ii) Polypropylene (PP) container

(2 marks)

iii) Microwaveable food container

(2 marks)

Q5 (a) Filler metal is used in fusion welding, brazing and soldering. Define fusion welding, brazing and soldering.

(6 marks)

(b) The location of filler metal of fusion welding and brazing for butt joint are shown in **Figure Q5(b)**. Determine the filler material of fusion welding and brazing for:

i) corner joint

(1 ½ marks)

ii) lap joint

(1 ½ marks)

iii) tee joint

(1 ½ marks)

iv) edge joint

(1 ½ 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 You work in one of the leading industrial machinery solution companies in Malaysia. The company purchases raw materials and produces end products such as engine blocks and bearings.
A national car maker just recently appointed the company to supply an engine block to a new mid-range car model. As part of the Research and Development (R&D) team of your company, you are assigned to provide the following tasks:

(a) Propose suitable material for the engine block.
(2 marks)

(b) Justify your material proposal by relating the answer to the requirement of the product.
(6 marks)

(c) Draw the flow chart for producing the engine block. The flow chart shall start from raw material form until it becomes the engine block finished product.
(6 marks)

(d) Describe **three (3)** possible visible defects that can occur during the casting of the engine block.
(6 marks)

Q7 Your work interest is in the field of plastic injection molding. To rival LEGO products, you have been requested to produce interlocking plastic bricks as illustrated in **Figure Q7**.

(a) The material that you decided to use is thermoplastic material. Discuss your reasons with relates to the bricks.
(4 marks)

(b) Describe **there (3)** types of mold used in plastic injection.
(6 marks)

(c) From the types of mold in Q7(b), discuss the best mold to produce the plastic bricks.
(4 marks)

(d) Precision in terms of dimension and shape is required for the bricks to easily interlock with each other during assembly. Describe the possible ways to improve this precision.
(6 marks)

- END OF QUESTIONS -

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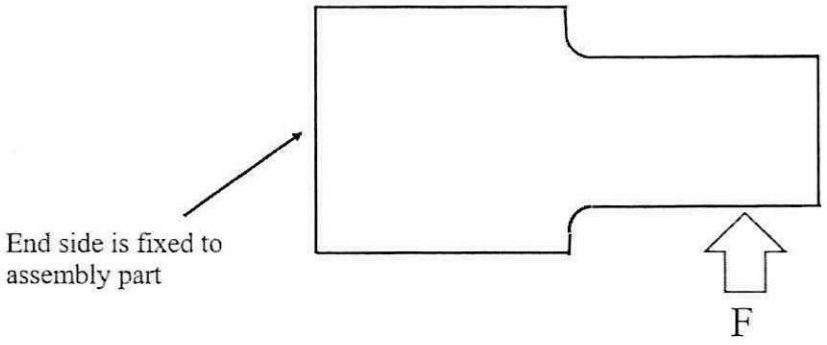

A 2D view of round metal bar after lathe process

Figure Q2(b)

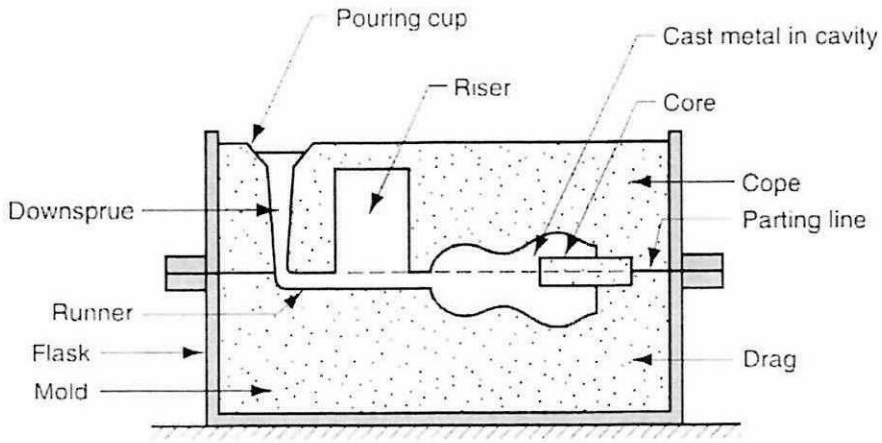

Figure Q2(c)

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i) Polystyrene (PS) foam container	
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Figure Q4(d)

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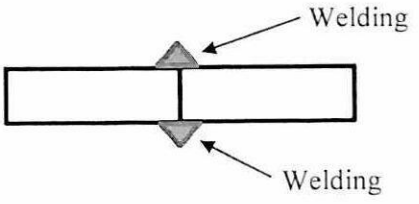
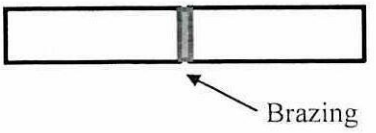
	Fusion Welding	Brazing
Butt Joint		

Figure Q5(b)

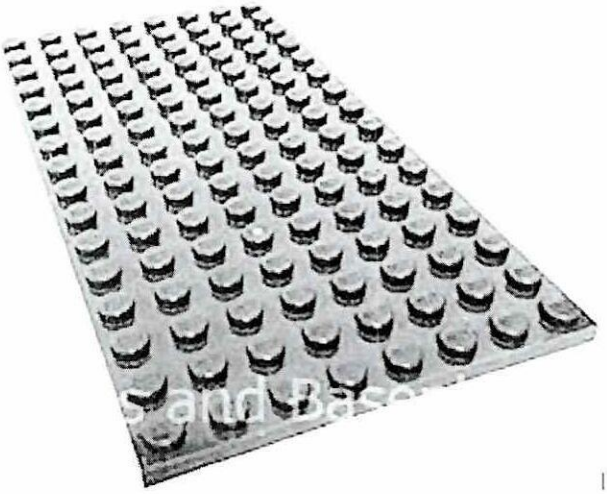


Figure Q7