Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

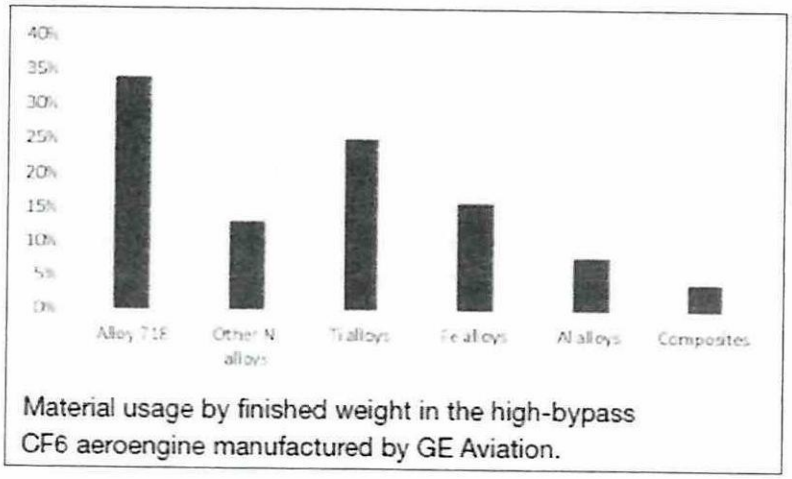
FINAL EXAMINATION
SEMESTER II
SESSION 2023/2024

COURSE NAME	:	DESIGN FOR MANUFACTURING
COURSE CODE	:	BDX 20702
PROGRAMME CODE	:	BDX
EXAMINATION DATE	:	JULY 2024
DURATION	:	2 HOURS
INSTRUCTIONS	:	1. ANSWER ALL QUESTIONS 2. THIS FINAL EXAMINATION IS CONDUCTED VIA ☐ Open book ☒ Closed book 3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **FOUR (4)** PAGES

Q1 Modern aircraft comprise three major components: airframe, propulsion, and systems. The airframe is the basic structure of an aircraft and is designed to withstand all aerodynamic forces, as well as the stresses imposed by the weight of the fuel, crew, and payload.

(a) According to graft data in **Figure Q1.1**, justify **FOUR (4)** reasons why Alloy 718 and Titanium Alloy are the most used materials for aero-engine components.



Material usage by finished weight in the high-bypass CF6 aeroengine manufactured by GE Aviation.

Figure Q1.1

(8 marks)

(b) Analyze the critical considerations for specific aircraft structures on i) fuselage design, ii) wing design, iii) empennage, and iv) landing gear.

(8 marks)

(c) Due to the application of high cutting speed, justify **FOUR (4)** reasons why total production cost increased after 600 FPM (feed per minute), as tolerance and surface finish becomes increasingly fine. Refer **Figure Q1.2** as reference.

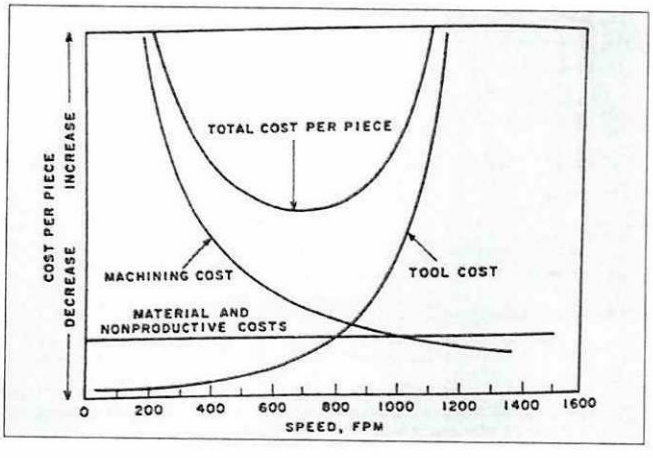


Figure Q1.2

(9 marks)

Q2 (a) Describe the deep drawing in sheet metal forming and give an example of an aircraft part that used the deep drawing method for the shaping process

(8 marks)

(b) With the help of sketch, distinguish between shearing, blanking and punching processes in sheet metal cutting.

(9 marks)

(c) By using **Figure Q2.1** as a reference, evaluate **FOUR (4)** mistakes to be avoided when designing sheet metal parts.

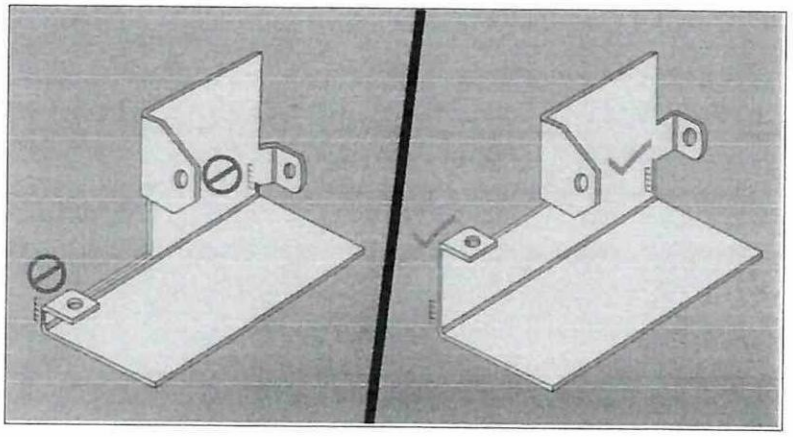


Figure Q2.1

(8 marks)

Q3 (a) Producing plastic is cheap, but it is done using a variety of toxic chemicals and colors, which can cause harm to the environment. Plastics also cannot withstand high-temperature conditions. However, the aircraft industry also relies on plastic. Justify **FOUR (4)** reasons for implementing injection molding in the aircraft industry.

(8 marks)

(b) Interpret DFMA design consideration in injection moulding based on **Figure Q3.1.**

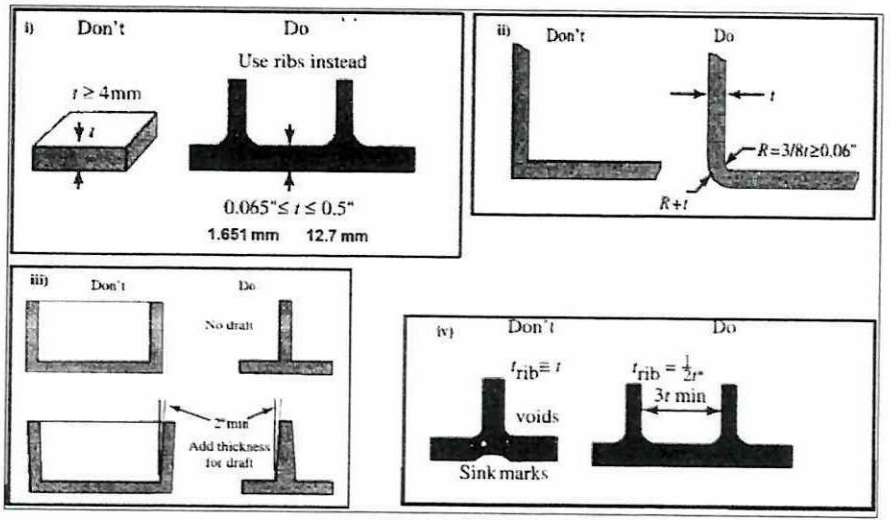


Figure Q3.1

(8 marks)

(c) The quality of the product by injection molding is also affected by the design of the mold. Analyze **THREE (3)** product design guidelines in making molds for injection molding.

(9 marks)

Q4 (a) Justify **THREE (3)** reasons why manufacturers try to avoid post-processing operation when fabricating a product. Support your judgment with a suggestion on how to reduce the possibility of post-processing operation.

(10 marks)

(b) The primary function of coating and painting is to guard against corrosion and enhance the aerodynamics of the aircraft. It is very important to choose the right paint for an aircraft due to various reasons including compatibility to aircraft materials, durability, cost and many other factors. Analyze **FOUR (4)** reasons why most aircraft are painted white colour.

(9 marks)

(c) Explain the importance of applying surface treatment in aircraft components.

(6 marks)

- END OF QUESTIONS -