UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(TAKE HOME)
SEMESTER II
SESSION 2020/2021

COURSE NAME	:	ADVANCED MANUFACTURING PROCESS
COURSE CODE	:	CDP 10103
PROGRAMME	:	CDP
EXAMINATION DATE	:	JULY 2021
DURATION	:	6 HOURS
INSTRUCTION	:	ANSWER **FIVE (5)** QUESTIONS ONLY **OPEN BOOK EXAMINATION**

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

Q1 (a) Shopping bags and other plastic objects are not decomposed by micro-organisms. Discuss on environmental impacts of plastic bags that have been washed through stormwater drains into a waterway.

(4 marks)

(b) Gear is one of the engineering products that can reasonably be made from two or more of the basic material families (metals, polymers, ceramics and composites).

(i) Identify **ONE (1)** area of application that gear will be used

(1 marks)

(ii) From **Q1(b)(i),** identify **TWO (2)** properties which would be required for the gear to perform its function?

(4 marks)

(iii) From **Q1(b)(ii), c**hoose **TWO (2)** materials families might provide reasonable candidates for the gear

(3 marks)

(iv) Between the two materials in **Q1(b) (iii)**, which of the two would you prefer? Justify your answer.

(8 marks)

Q2 (a) Laser Micro-welding is conducted using a combination of small focus spot size and high peak power. Describe its **FOUR (4)** characteristics that provide useful advantages.

(8 marks)

(b) Precision machining technology is widely used in the defense industry, high-tech industry, aerospace and other fields. The advanced cutting tool is an indispensable factor in achieving precision machining technology. The study on superhard cutting tool with wear-resistant and stable characteristics, therefore :

(i) Identify **ONE (1)** superb cutting tool type related to mechanical micro machining application.

(2 marks)

(ii) From **Q2(b)(i),** determine **FIVE (5)** characteristics of the cutting tool.

(5 marks)

(c) Distinguish between chemical micro machining categories by provide aids of sketches.

(5 marks)

Q3 (a) Which types of parts will you recommend to produce by using wire Electrode Discharge Machining (EDM)?

(5 marks)

(b) Evaluate the characteristic of additive manufacturing given in **Table 3** and **Figure Q3**

(9 marks)

(c) Additive manufacturing is an innovative technique moving towards the customized production of dental implants and other dental tools using computer-aided design (CAD) data. Evaluate a suitable 3D rapid prototyping technique to produce a product given in **Figure Q3**.

(6 marks)

Q4 (a) Analyze **THREE (3)** challenges regarding micro-sheet forming production especially for the forming of sheets of less than 100 microns in thickness and feature sizes less than sub-milimeters.

(6 marks)

(b) As a mechanical engineer in your company, you are assigned to design a tool system for micro-sheet forming. Propose **THREE (3)** the forming tool design and manufacturing for micro-sheet forming.

(9 marks)

(c) With aids of sketch, compose about the warm forging of micro component.

(5 marks)

Q5 (a) Mechanical assembly in joining process requires coordination of many parts, tools, fixtures, packages, people and companies. Identify **THREE (3)** processes that are related to mechanical assembly.

(3 marks)

(b) Laser microwelding is used for joining high value miniature component in a range of industries. Defend your decision selecting laser microwelding by explaining the advantages of this process compared to conventional microwelding methods.

(8 marks)

(c) Fusion microwelding inherently has all the problems of macro-joining processes. Evaluate **THREE (3)** problems in applying fusion micro-joining.

(9 marks)

Q6 (a) Electrochemical Grinding (ECG) is one of the hybrid electrochemical machining process. Asses you answer based on ECG equipment and working principle.

(10 marks)

(b) Based on **Q6(a)**, support your answer by providing the advantages and limitations of the selected hybrid elecrochemical machining process.

(10 marks)

- END OF QUESTIONS –

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Table 3: Characteristic of additive manufacturing

No	Type	Process	Layer Method	Material
A	Liquid	-	Curing	-
B	Solid	-	-	Paper
C	-	-	Sintering	-

FIGURE Q3: Orthodontic aligner