



Second Semester Examination
2022/2023 Academic Session

July 2023

**EPP 212 – Advanced Manufacturing Technology
(Teknologi Pembuatan Termaju)**

Duration: 3 hours
(Masa: 3 jam)

Please check that this examination paper consists of SIX (6) pages of printed material before you begin the examination.

[Sila pastikan bahawa kertas peperiksaan ini mengandungi ENAM (6) muka surat yang bercetak sebelum anda memulakan peperiksaan ini].

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

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

1. [a] Figure 1[a] shows some chatter marks on a workpiece surface during milling process that might occurred possibly either due to forced or self-excited vibration. Identify TWO (2) main differences between forced and self-excited vibration and through sketching, explain ONE (1) example to prevent each type of vibration.



Figure 1[a]

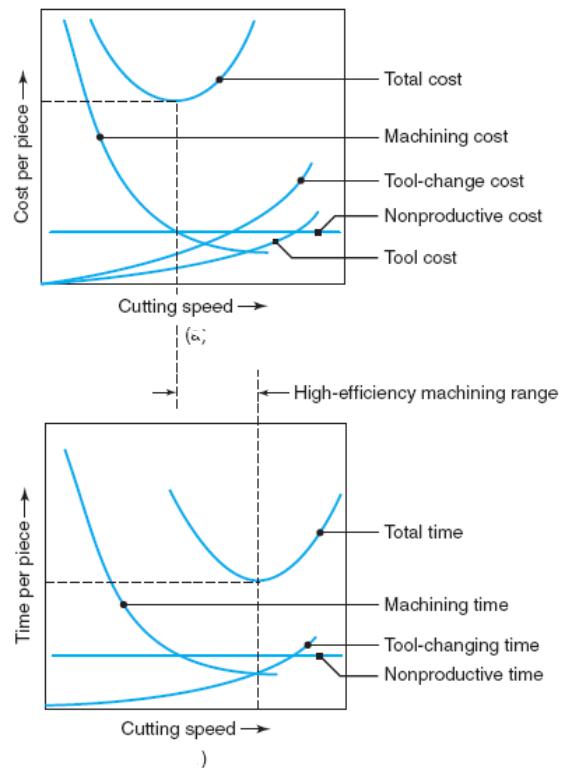
(40 marks)

- [b] Ultraprecision and hard machining are required for different purposes of machining. Differentiate and explain THREE (3) design considerations of machining centres that are required for both ultraprecision and hard machining purposes.

(30 marks)

- [c] An advanced machining company is required to produce a thousand structural components that need to go through milling and drilling processes within a short period of time. Based on your judgement by referring to Figure 1[c] below, what is the optimum cutting speed to proceed with. Please justify your answer briefly.

(30 marks)

**Figure 1[c]**

2. [a] Electrical discharge machining (EDM) is a powerful, nonconventional machining technique with the ability to machine any conductive material regardless of mechanical property. Using sketch, briefly explain the working principles of EDM.

(30 marks)

- [b] Figure 2[b] shown below is the metal block with 30mm thickness that has been cut using laser beam machining (LBM) process.

- [i] Analyse TWO (2) root causes of block's poor surface quality

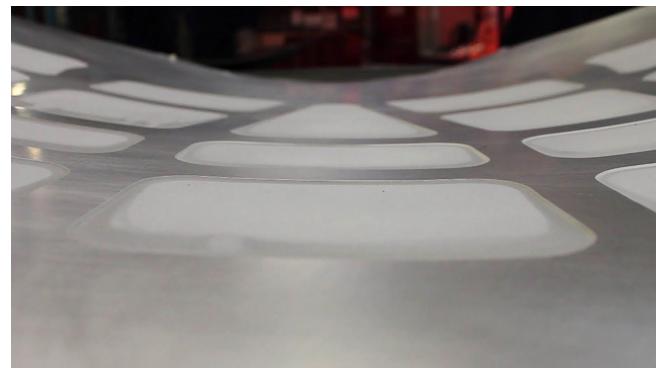
(20 marks)

- [ii] With justification, suggest TWO (2) alternative non-traditional machining process that able to cut that metal block efficiently.

(20 marks)

**Figure 2[b]**

- [c] An LBZ company is required to produce hundreds of aircraft skin structures of 4mm thickness (Figure 2[c]) using an advanced machining process, but its main concern is that it is generally slower than conventional machining operations. Identify ONE (1) most suitable non-traditional technique to machine that part and TWO (2) reasons to justify your selection.

**Figure 2[c]****(30 marks)**

3. [a] [i] A CNC programme commonly has commands that can be classified as either modal command or block active command. Describe each of them and give an example of CNC code for each type

(20 marks)

- [ii] With the help of illustration, differentiate between programming code G00, G01 and G02.

(20 marks)**...5/-**

- [b] An engineering component made of aluminum as shown in Figure 3[b] need to be machined using CNC machine by Company A. Using standard G-code programming, prepare a complete code for machining the part to get optimum toolpath. Use absolute coordinate in your G-code programming. You need to justify your approach and answer. State all conditions and assumptions you have used.

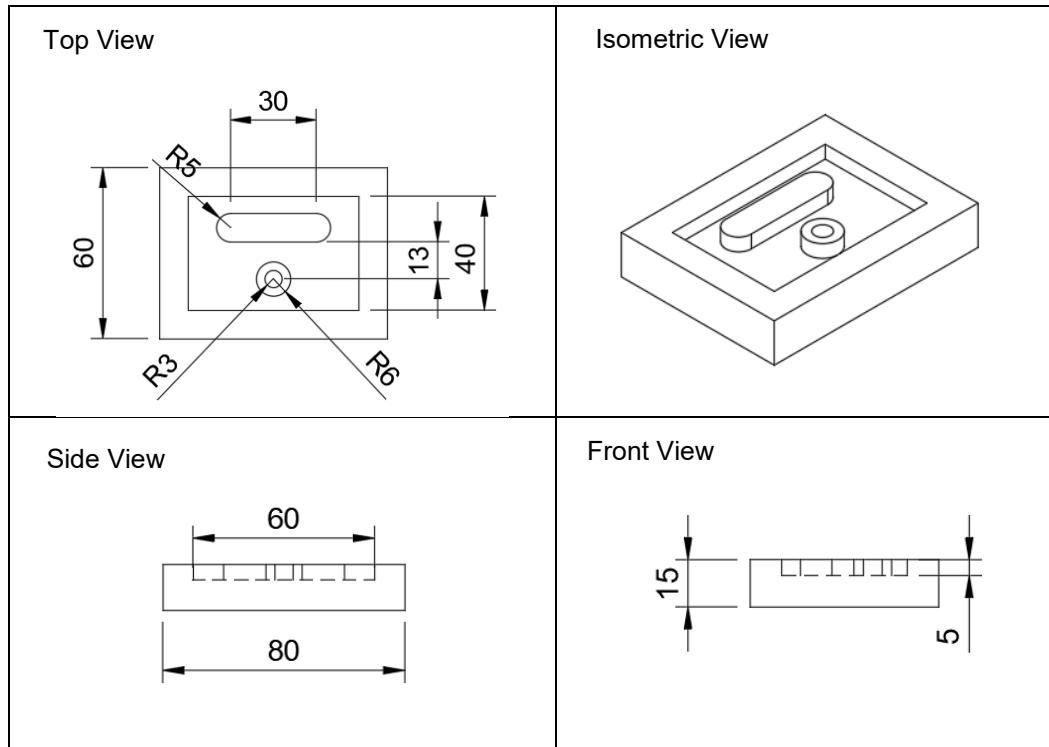


Figure 3[b]

(60 marks)

4. [a] Define the following terminologies from manufacturing perspective: (i) Computer Aided Design (CAD), (ii) Computer Aided Manufacturing (CAM), (iii) Enterprise Resource Planning (ERP).

(30 marks)

- [b] Give THREE (3) advantages of applying CAD/CAM in manufacturing industry.

(30 marks)

- [c] Using illustration, describe step by step process using CAD/CAM software for obtaining CNC code that can be used on a 5-axis CNC machine for machining a part.

(40 marks)

...6/-

5. [a] Since 1986, 3D printing has evolved from a technology that caters for just prototype for fabrication into wide range of applications across many fields including direct manufacturing, medical, aerospace, automotive, arts and architecture, construction, etc. From your observation, what are TWO (2) factors that contribute to this rapid change and diversification of the technology. Please show how each factor contribute to the evolution and justify your answer.

(50 marks)

- [b] An archeologist is discovering an exciting artifact with valuable historical value that could potentially change the narrative of how and when dinosaur really began to extinct in the past. The artifact is however very fragile, with some parts already fragmented, some parts are missing too. Further study and experimentation is needed in order to form clear judgement and to come to more accurate conclusions. Suggest your own strategy in order to fully utilize 3D printing technology to help scientist discover more valuable information from the artifact.

(50 marks)

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...7/-