Second Semester Examination
2021/2022 Academic Session

July/August 2022

EPP212 – Advanced Manufacturing Technology
(Teknologi Pembuatan Termaju)

Duration : 2 hours
(Masa : 2 jam)

Please check that this examination paper consists of FIVE [5] pages of printed material before you begin the examination.

[Sila pastikan bahawa kertas peperiksaan ini mengandungi LIMA (5) muka surat yang bercetak sebelum anda memulakan peperiksaan ini.]

INSTRUCTIONS : Answer **ALL FOUR [4]** questions.

[**Arahan** : Jawab **EMPAT (4)** soalan.]

…2/-

1. [a] Describe the distintive features of machining centers and explain why these machines are so versatile?

(20 marks)

a. b.

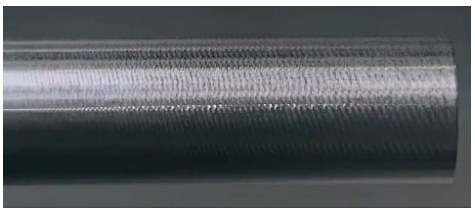

Figure 1

[b] When turning a slander bar on the lathe machine in Figure 1a, chatter problem is a common occurrence as depicted in Figure 1b.To solve the above problem, suggest and justify TWO (2) physical improvements that can be made to the aforementioned system.

(40 marks)

[c] Ultra-precision machining technologies are the essential methods to obtain the highest form accuracy and surface quality. Compare TWO (2) general considerations if hard/brittle and soft/ductile materials need to be precisely machined.

(40 marks)

2. [a] Abrasive-water jet (AWJ) cutting is an intricate procedure that is exemplified by several process parameters that decide quality and efficiency of the whole process. Figure 2 shows the common defect (embedded abrasives) at the drilled hole wall on carbon fiber reinforced polymer (CFRP) composite samples when drilled using AWJ technique. Based on your judgement, is AWJ still an efficient technique to cut the laminate CFRP composite workpiece? Give TWO (2) reasons to justify your answer.

…3/-

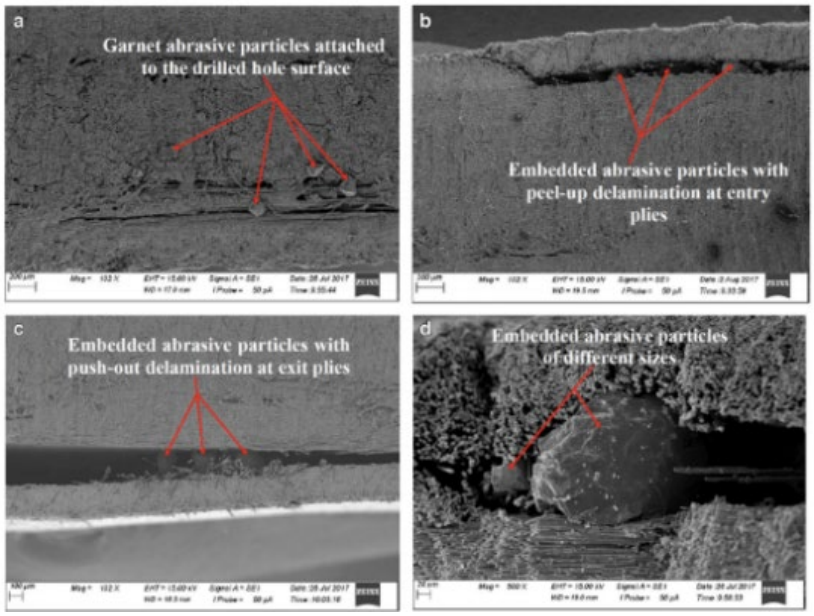

Figure 2

(40 marks)

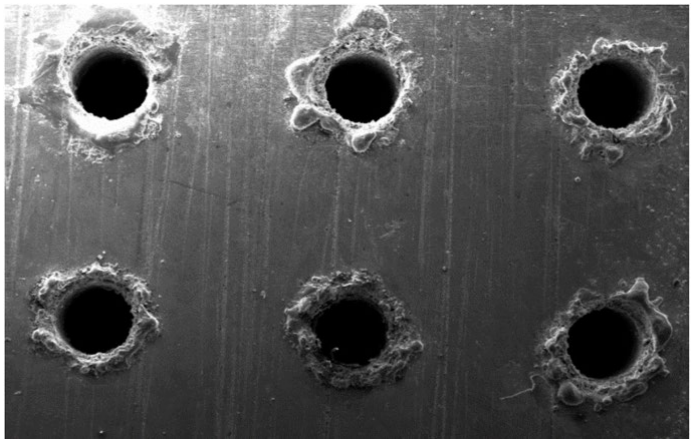

Figure 3

[b] Figure 3 shows a scanning electron microscopy (SEM) image of holes drilled into titanium alloy plate by an electrical discharge machining (EDM). Discuss the working principles of the EDM and cause of defect of the drilled holes. Suggest TWO (2) ways to prevent it.

(60 marks)

…4/-

3. [a] (i) A CNC programme commonly has THREE distinct sections. Name the THREE (3) sections and give example of a programme line for each section.

(20 marks)

(ii) Differentiate between programming code G40, G41 and G42. Use illustration to show the difference between them.

(20 marks)

[b] An engineering component made of aluminum as shown in Figure 3[b] need to be machined using CNC milling 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.

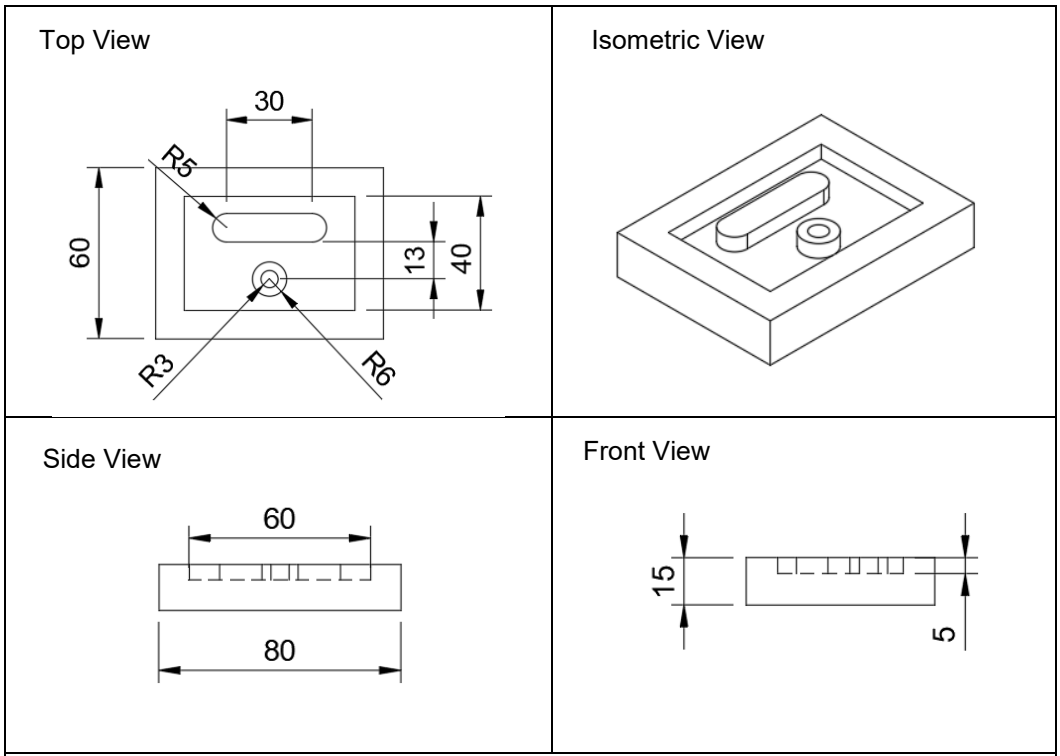

Figure 3[b]: Aluminum part for CNC machining

(60 marks)

…5/-

4. [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 the factors that contribute to this rapid change and diversification of the technology. Please elaborate THREE (3) factors that 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 are needed in order to form clear judgement and to come to more accurate conclusions. Come up with your strategy in order to fully utilize 3D printing technology to help scientist discover more valuable information from the artifact.

(50 marks)

- oooOooo –