



First Semester Examination
2022/2023 Academic Session

February 2023

EPP 331 – Manufacturing Technology II
(Teknologi Pembuatan II)

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 **SIX (6)** questions.

Arahan: Jawab **ENAM (6)** soalan]

1. (a) Defect is a common phenomenon when producing plastic components using the injection molding.
 - (i) With the help of a sketch, describe **TWO (2)** types of defects that can occur during the process.
(20 marks)
 - (ii) Explain **TWO (2)** methods that can be implemented to avoid the defects to occur.
(20 marks)
- (b) A glass window plate for home and office applications can be produced by using few processing methods.
 - (i) With the help of a sketch, explain **ONE (1)** processing method of manufacturing a glass window plate.
(40 marks)
 - (ii) Describe the surface finish of the glass plate produced by this method. Decide if further polishing is necessary after this manufacturing process?
(20 marks)
2. (a) CNC machine is a machining center with great flexibility to carry out a various number of mechanical operations. Explain **TWO (2)** problems that normally occur during CNC machining in the School of Mechanical Engineering fabrication's lab. Provide **ONE (1)** solution to each problem.
(30 marks)
- (b) Vibration and chatter may reduce the surface quality of the machined surface during the machining process. Suggest **ONE (1)** solution to reduce vibration and **ONE (1)** solution to reduce the chatter problem.
(20 marks)

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- (c) In the machining of engine piston, the labor rate is RM 21.50 per hour and the general overhead rate is RM 12 per hour. The tool is cast alloy ($n = 0.15$) with six faces and costs RM 32.50, which takes seven minutes to change and two minutes to index the tool.
- (i) Given that the optimum cutting speed for maximum production is 100.55 m/min, calculate the tool life constant value for this machining process.
- (ii) By using answer in Q2 [c] (i), calculate the optimum cutting speed in term of cost perspective for this machining process.
- (iii) Due to global economic challenges in 2022, the labor rate and overhead rate is increase, causing the optimum cutting speed in terms of cost perspective for this machining process changes to 100.15 m/min. Decide whether is it still effective or not for the company to produce the engine piston.

(Note: Use the following equations for Q2 (c) i and ii).

$$V_o = \frac{C (L_m + B_m)^n}{(\frac{1}{n} - 1)^n \psi^n} \quad (1)$$

$$V_o = \frac{C}{\left[(\frac{1}{n} - 1) (\frac{T_c}{m} + T_i)^n \right]} \quad (2)$$

Where,

$$\psi = \frac{1}{m} [T_c(L_m + B_m) + D_i] + T_i(L_m + B_m)$$

(50 marks)

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3. (a) An efficient material handling system may give positive impacts on the manufacturer by improving productivity and providing a safe working environment for the workers. A manufacturing plant operates 10 hours daily and requires to move 50 000 pieces of 100 kg boxes monthly. As an engineer, you have been assigned to propose a suitable material handling method between forklift and Automatic Guided Vehicle (AGV) for moving the boxes. Decide the best material handling system based on time, safety and cost.

(40 marks)

- (b) By taking industrial robots as an example, explain **TWO (2)** benefits of automation with respect to the sustainable manufacturing.

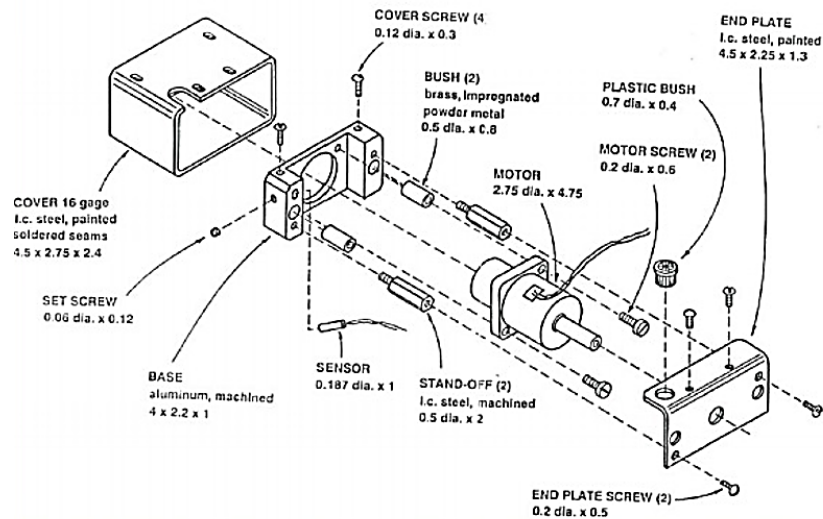
(30 marks)

- (c) Expert system is a knowledge-based system that uses an intelligent computer program to solve difficult real life problems. Describe **THREE (3)** main components in an expert system to perform its function.

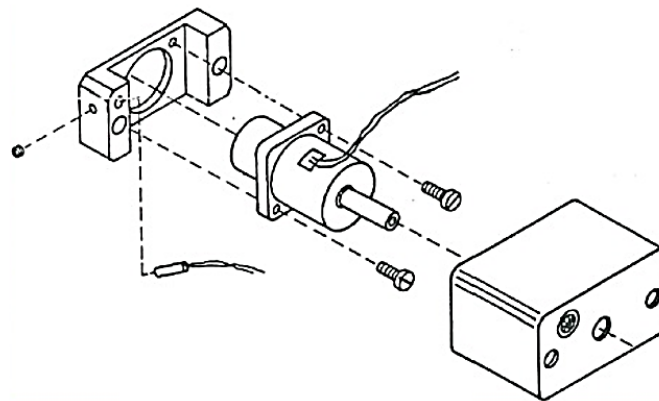
(30 marks)

4. (a) Design for Manufacturing and Assembly (DFMA) is a method applied to minimize the cost of production and time while maintaining an appropriate level of quality. Figure Q4[a] shows the components of the motor drive at the initial design and after redesign using DFMA. Based on the figure, justify **THREE (3)** changes that have been made to improve the design and identify the related DFMA design guidelines that have been applied.

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Initial design



After DFMA

Figure Q4 (a)

(60 marks)

- (b) One of the methods in green manufacturing is by using clean technology. By giving **ONE (1)** example, discuss how clean technology can contribute to green manufacturing.

(40 marks)

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5. (a) Fused Deposition Modelling (FDM) is one of the rapid prototyping processes available in the manufacturing industry. With the aid of sketch, explain briefly about the working principle of the process.
(20 marks)
- (b) Discuss why the heating and printing temperatures with respect to the filament material are essential to be controlled during FDM process? State the type of hazardous gases emitted during the process if these parameters were improperly controlled?
(30 marks)
- (c) Discuss **TWO (2)** short term and **TWO (2)** long term effects of the hazardous gases emission to the workers. Suggest **ONE (1)** feasible solution to the FDM process to mitigate the hazard.
(50 marks)
6. (a) Chemical Machining (CM) is one of the advanced machining processes available in the manufacturing industry. With the aid of sketch, explain briefly about the working principle of the process.
(20 marks)
- (b) An improper disposal of hazardous chemicals from CM process such as cleaning solutions, and chemical etchants can change the acidity and alkalinity level in soil and water, thus, affecting human, animals, and environment. The scale of “potential of hydrogen” or denoted as pH is used to indicate the acidity or alkalinity of the aqueous solution. Discuss **ONE (1)** negative impact to the environment in relation with the pH value if chemical etchants such as nitric acids were improperly disposed.
(30 marks)
- (c) Cenviro Sdn. Bhd. or formerly known as Kualiti Alam Sdn. Bhd. Is Malaysia’s leading waste management company who is committed in building clean environment and sustainable future for the country. Discuss **ONE (1)** major role of Cenviro Sdn. Bhd. in managing chemical wastes from industries and propose **ONE (1)** synergistic solution that can be executed by Cenviro Sdn. Bhd. to effectively mitigate the potential hazard as stated in Q6 (b).
(50 marks)