



**UTHM**  
Universiti Tun Hussein Onn Malaysia

**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
SEMESTER II  
SESSION 2023/2024**

- COURSE NAME : POLYMER & CERAMIC ENGINEERING
- COURSE CODE : BDB 40603
- PROGRAMME CODE : BDD
- EXAMINATION DATE : JULY 2024
- DURATION : 3 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.

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**CONFIDENTIAL**

- Q1** (a) Suggest **THREE (3)** methods that can be used to avoid failure of brittle ceramic component during its operation and usage.  
(6 marks)
- (b) Discuss briefly the difference between dry milling and wet milling processes.  
(4 marks)
- (c) Observation and analysis that have been conducted by Claytan company to their failed of ceramic product have revealed that the failure of component are due to internal crack. Suggest **ONE(1)** cause and **ONE (1)** solution to avoid this problem happen in future with brief explanation.  
(6 marks)
- (d) Suggest **ONE (1)** applications of advanced ceramic in engineering and justify how the suitability of this ceramic properties able to be used in this applications.  
(4 marks)
- Q2** (a) Water composition is one of the main factors in the slip casting and injection moulding process. Based on this statement propose the drying plot for each component that had gone through both forming processes and explain the difference between two plots.  
(6 marks)
- (b) Provide an appropriate diagram to illustrate the differences between solid state sintering and liquid phase sintering.  
(5 marks)
- (c) Glazing is one of the most popular surface coating technique for ceramic porous product. State **THREE (3)** techniques of glazing that can be used.  
(3 marks)
- (d) Explain some drawback of ceramic component in design aspect and suggest several actions that should be taken in order to overcome this problem.  
(6 marks)

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- Q3** (a) Some ceramic component have been indentified failed due to the crack problems that were originated due to unproper milling condition that lead to the inhomogenous of particles size distribution across the ceramic structure. Propose a solution to overcome this problem by giving a brief explanation of this solution.
- (6 marks)
- (b) Discuss the different between plastic and wet forming of the ceramic body based on their main composition.
- (4 marks)
- (c) Ahmad has been assigned by his manager to solve the company problem in minimizing the production time of powder ceramic fabrication process. By maintaining the density and good structure of the final fabricated products, suggest the potential solution for Ahmad in choosing the best forming technique that is suitable to be used by giving strong justification.
- (6 marks)
- (d) Differentiate the difference between polymer and ceramic properties in general in terms of their structure and bonding.
- (4 marks)
- Q4** (a) Considering the advantages of thermoset and thermoplastic polymers, Suggest ONE (1) suitable application for each, based on these advantages.
- (5 marks)
- (b) Give a strong justification why thermoset component preferred to be used in many engineering applications especially at high temperature and as structural component.
- (5 marks)
- (b) Differentiate thermoplastic elastomer(TPe) with common types polymer i.e thermoset and thermoplastic and suggest TWO (2) solutions that offer by this materials that can replace other polymer materials.
- (5 marks)

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- (c) Justify the different in molecular structure that create the different in properties of both polymer Low density Polyethylene(LDPE) and High Density Polyethylene (HDPE).

(5 marks)

- Q5** (a) Suggest a suitable polymer processing technique for ONE (1) of the below polymer components and with an appropriate diagram explain in detail.

- i) Pipe or tubing with consistent cross section and shape
- ii) Bottle

(8 marks)

- (b) Differentiate thermoplastic elastomer(TPe) with common types polymer i.e thermoset and thermoplastic and suggest TWO (2) solutions that offer by this materials that can replace other polymer materials.

(6 marks)

- (c) Compounding of polymer with additives able to change and improve their physical, mechanical and processing properties in producing polymer alloy or blend. Justify the important of adding the following additives to the polymer structure or during the processing stage.

(6 marks)

**- END OF QUESTIONS -**

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