Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(ONLINE)
SEMESTER II
SESSION 2019/2020

COURSE NAME	:	ENGINEERING POLYMER AND CERAMIC
COURSE CODE	:	BDB 40603
PROGRAMME CODE	:	BDD
EXAMINATION DATE	:	JULY 2020
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWERS **FIVE (5)** QUESTIONS **ONLY.** **OPEN BOOK EXAMINATION**

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

Q1 (a) Suggest TWO (2) methods that can be used to avoid failure of brittle ceramic component during its operation and usage.

(4 marks)

(b) Discuss briefly the different between dry milling and wet milling process.

(5 marks)

(c) By considering the application of ceramic can be categorized into ceramic technical and ceramic traditional, evaluate how the suitability of the ceramic properties able to be used in both applications.

(6 marks)

(d) Mr. Hakim found that ceramic particles in the produced slurry were agglomerated and not distributed uniformly. Therefore, he used a lubricant additive to overcome this problem. Justify whether the additive that has been applied by Mr. Hakim is suitable or not? Suggest TWO (2) additives that can overcome the particles agglomeration problem.

(5 marks)

Q2 (a) i. Water composition is one of the main factor in the slip casting and extrusion forming processes. Based on this statement construct the drying plot for each of these components that had gone through the drying process. Please sketch this drying plot in a one plot of drying curve to show the differences.

(4 marks)

ii. Based on your knowledge on the drying stages and also moisture content or types of water inside the porous particles, justify the difference between these two plots in (a)i by giving explanation at each stages

(6 marks)

(b) Construct the different between solid state sintering and liquid phase sintering by using an appropriate diagram.

(5 marks)

(c) Give some drawbacks of ceramic component in design aspect and suggest several actions that should be taken in order to overcome this problem.

(5 marks)

Q3 (a) Propose a suitable forming process that can be produced sanitary ware as shown in Figure Q3(a) and explain it briefly.

(6 marks)

(b) Contamination is a problem in milling process. Suggest TWO (2) methods that can be used to control or to overcome contamination during the milling process.

(4 marks)

(c) Based on this statements during the grinding process "When mills rotating too fast – centrifuging will occur and when too slow speeds – slipping of the media occurs". Explain briefly what was happen inside the mill and suggest several actions that need to be conducted in order to get an optimum milling process.

(6 marks)

(d) Glazing is one of the most popular surface coating technique for ceramic porous product. Suggest TWO (2) techniques of surface coating that can be used.

(4 marks)

Q4 (a) In polymer synthesis, there are TWO (2) types of polymerization technique which are addition polymerization and condensation polymerization. Based on this statement answer the following questions;

i. Construct the sequence of simple equation of addition polymerization to illustrate the initiation, propagation and termination of the network polymerization process.

(6 marks)

ii. Suggest ONE (1) of the polymer types or product that can be formed in both types of polymerization technique.

(4 marks)

(b) With considering some advantages of thermoset and thermoplastic polymer, suggest ONE (1) suitable application of these polymer with brief explanation.

(5 marks)

(c) Suggest TWO (2) most common polymer processing operations or fabrication technique and illustrate in detail this technique by giving a suitable diagram.

(5 marks)

Q5 (a) Give several justification what are the main advantages of polymer over ceramic in terms of design and processing that makes these materials are more preferable in most engineering component and application

(5 marks)

(b) Liquid crystal polymer is widely used in electrical application and other advanced application. By using an appropriate diagram sketch this material structure and discuss briefly this materials characteristic and property.

(5 marks)

(c) Modification of polymer can be compounded with additives or filler to form either polymer alloys or blends. Suggest THREE (3) additives which normally used in this formation process.

(6 marks)

(d) Discuss the differences between thermoset and thermoplastic properties in general that have made both materials have been used for difference purposes.

(4 marks)

Q6 (a) Most polymer materials is an amorphous structure or is a non-crystalline materials. Based on this statement answer the following questions;

i. Using a suitable diagram sketch the semicrytalline and amorphous structure.

(4 marks)

ii. Suggest several factor that affect the polymer crystallinity and also justify crystallinity effect towards mechanical property of polymer (should state at least TWO (2).

(6 marks)

(b) There are several mode of polymer failure. Using a suitable diagram construct the different between brittle failure and crazing failure support with a brief explanation.

(5 marks)

(c) Suggest several steps that should be taken in improving the failure resistance of polymers in service condition.

(5 marks)

–END OF QUESTION–

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Figure Q3 (a)