



UTHM

Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION SEMESTER II SESSION 2023/2024

- COURSE NAME : MATERIALS TESTING
- COURSE CODE : BDB 40203
- PROGRAMME : BDD
- EXAMINATION DATE : JULY 2024
- DURATION : 3 HOURS
- INSTRUCTION :
1. ANSWER **FIVE (5)** QUESTIONS FROM SIX (6) QUESTIONS ONLY
 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 FIVE (5) PAGES

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- Q1** (a) Explain why tensile testing normally use for metal materials (4 marks)
- (b) Sketch the typical engineering stress-strain for brittle, ductile and plastic materials. (4 marks)
- (c) Compare between fatigue and creep. (5 marks)
- (d) Select THREE (3) hardness indenters with justification the method that commonly used in the laboratory. (7 marks)
- Q2** (a) Identify FOUR (4) Non Destructive Testing for surface inspection. (4 marks)
- (b) Sketch the steps of liquid penetrant inspection. (4 marks)
- (c) Differentiate the principle between magnetic particle and Eddy Current testing. (5 marks)
- (d) Select THREE (3) visual inspection that are used for storage tank and pipeline. (7 marks)
- Q3** (a) Identify the abrasives materials for polishing. (2 marks)
- (b) Identify TWO (2) purposes of sectioning. (2 marks)
- (c) Write the steps of hot mounting process for metal specimens. (5 marks)
- (d) Compare the process between hot mounting and cold mounting. (4 marks)
- (e) Evaluate the images in **Figure Q3.1 i** and **ii** and explain the imaging formation. (7 marks)

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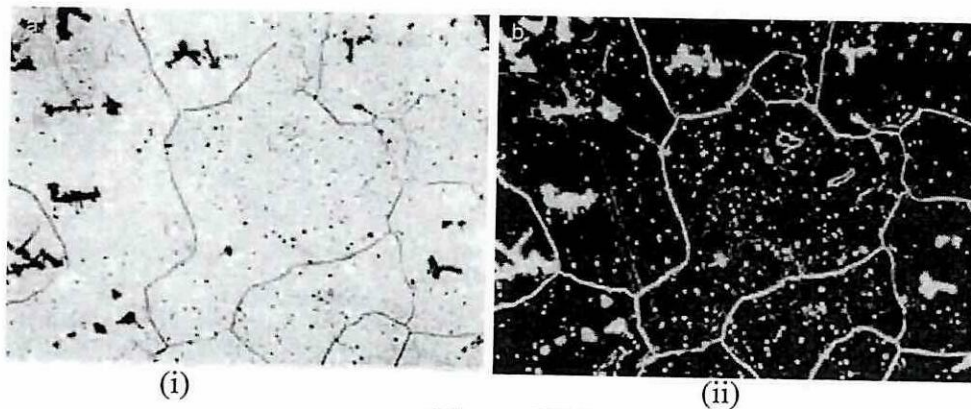


Figure Q3.1

- Q4** (a) Explain the information that can be obtained from Transmission Electron Microscope (TEM) characterisation. (4 marks)
- (b) Sketch the interaction of electron-solid in Scanning Electron Microscope (SEM). (4 marks)
- (c) Distinguish between secondary electron and backscattered electron. (5 marks)
- (d) Evaluate SEM images of sample Al_2O_3/Ni composite as shown in **Figure Q4.1 (i and ii)** in term of signal and function. (7 marks)

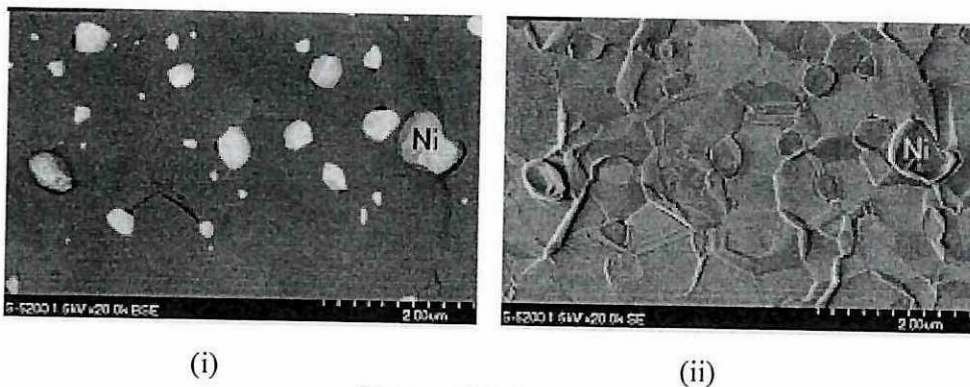


Figure Q4.1

- Q5** (a) Explain the functions of X-Ray Diffraction (XRD) in the characterisation of materials. (4 marks)
- (b) Interpret the XRD result as shown in **Figure Q5.1**. (4 marks)

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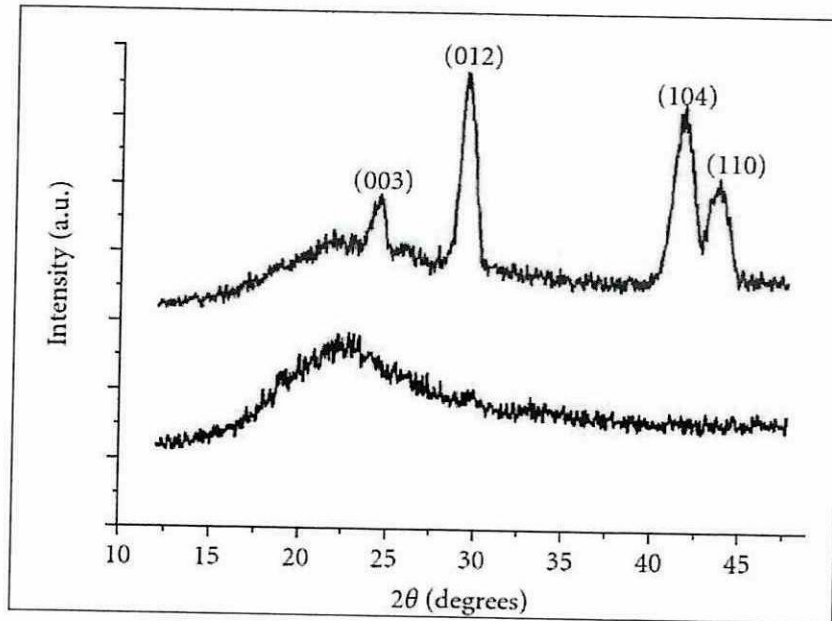


Figure Q5.1.

(c) Differentiate the applications between X-Ray Fluorescence (XRF) and XRD in materials science and engineering.

(6 marks)

(d) Evaluate the type of vibration for FTIR in Figure Q5.2.

(6 marks)

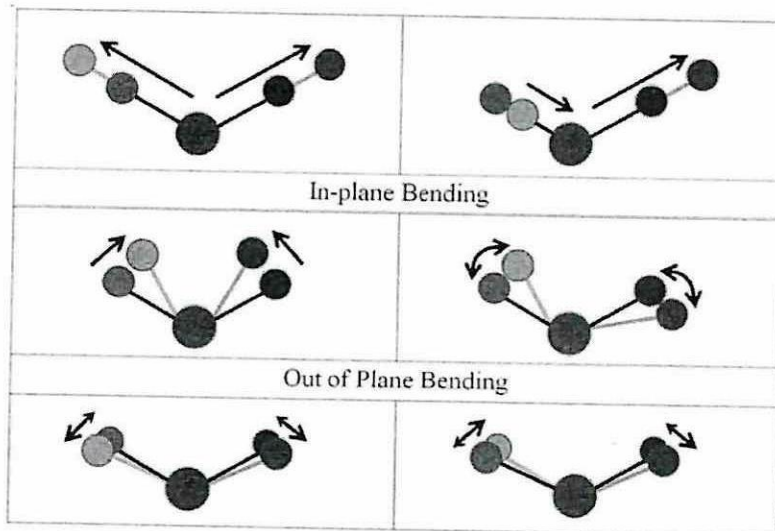


Figure Q5.2.

Q6 (a) Explain the applications of thermogravimetric analysis (TGA) in Materials Engineering.

(4 marks)

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- (b) Write TWO (2) functions of dynamic mechanical analysis (DMA). (4 marks)
- (c) Examine SIX (6) of the typical weight loss profile of TGA as shown in **Figure Q6.1**. (6 marks)

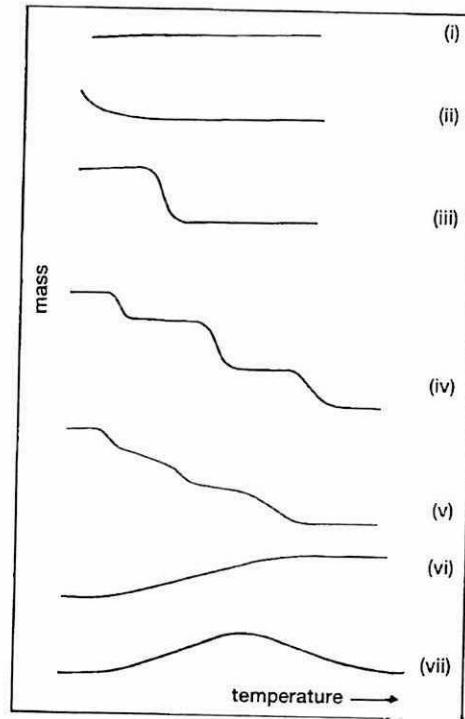


Figure Q6.1.

- (d) Evaluate the typical plot for thermal analysis of Differential Scanning Calorimeter (DSC) in polymer sample as shown in **Figure Q6.2**. (6 marks)

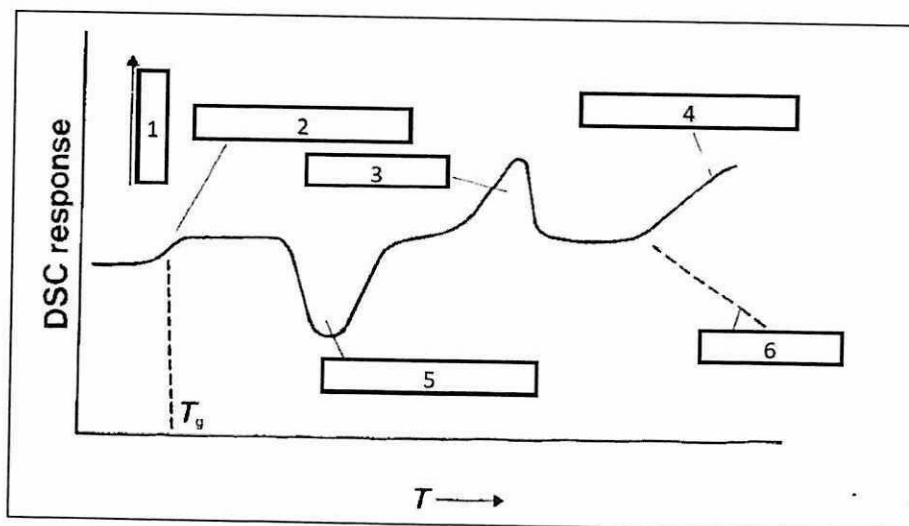


Figure Q6.2.

- END OF QUESTION -