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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2013/2014**

COURSE NAME : MATERIALS TESTING
COURSE CODE : BDB 40203
PROGRAMME : 4 BDD
EXAMINATION DATE : JUNE 2014
DURATION : 3 HOURS
INSTRUCTION : ANSWER FIVE (5) QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF SIX (6) PAGES

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- Q1** (a) Differentiate between hardness and toughness. (4 marks)
- (b) In the Astaka oil company have thousands of miles of pipeline carrying oil. The pipe is vulnerable to attack by internal and external corrosion, cracking, third party damage and manufacturing flaws. In an attempt to keep pipelines operating safely, periodic inspections are performed to find flaws and damage before they become cause for concern. Select ONE (1) of Non-Destructive Testing (NDT) that can be used and explain in detail. (10 marks)
- (c) The standards produced by ASTM International fall into six categories. Explain in details THREE (3) of them. (6 marks)
- Q2** (a) Tensile test always use to analyze strength of materials. From the Figure **Q2 (a)**, explain in detail the results that could be obtained from the graph. (10 Marks)
- (b) Visual inspection is one of the most common and most powerful means of non-destructive testing. Explain in details the various optical aids used in visual inspections and their applications. (10 marks)
- Q3** (a) Eddy Current testing is particularly well suited for detecting surface cracks but can also be used to make electrical conductivity and coating thickness measurements. Summarize the advantages and limitations of Eddy Current testing. (10 marks)
- (b) Fatigue failures occur under dynamic or fluctuating stresses. Develop THREE (3) the possible stress versus time curve that occurs in fatigue test. (6 marks)
- (c) Define Non-destructive testing (NDT) and identify SIX (6) of the most common NDT method. (4 marks)

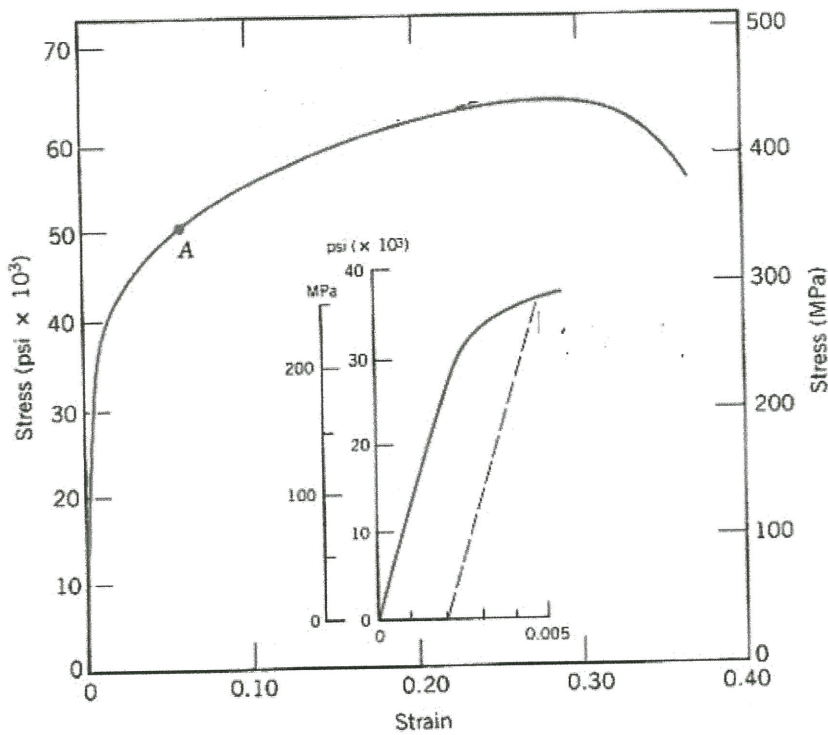
- Q4** (a) We have samples of an annealed Al alloy and an annealed plain carbon steel to be examined. The polishing area of samples is about 10 mm x 5 mm. Summarize how the sample preparation will be done to identify the microstructure of that samples using optical microscope. (10 marks)
- (b) Based on Figure **Q4 (a)** and **Q4 (b)**, select the suitable electron that can be used from Scanning Electron Microscopy (SEM). Explain in detail about the selected electron. (10 marks)
- Q5** (a) Identify the different between Differential Scanning Calorimeter (DSC) and Thermo Gravimetry Analysis (TGA). (4 marks)
- (b) Construct the normal plot for thermal analysis of Differential Scanning Calorimeter (DSC) in polymer sample. Explain the mechanism of polymer structure for every different and exchanges of thermal using the plot. (10 marks)
- (c) Analyze the Thermo Gravimetry Analysis (TGA) result from the Figure **Q5 (c)**. (6 marks)
- Q6** (a) Explain briefly the advantages and limitations of Atomic Absorption Spectroscopy (AAS). (4 marks)
- (b) Illustrate the Fourier Transform Infrared Spectroscopy (FTIR) equipment and identify every parts of that equipment. (10 marks)
- (c) Compare between X-ray Powder Diffraction (XRD) and X-ray Fluorescence Spectrometry (XRF) in terms of their similarities and differences. (6 marks)

- END OF QUESTION -

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The Stress-Strain behaviour

FIGURE Q2(a)

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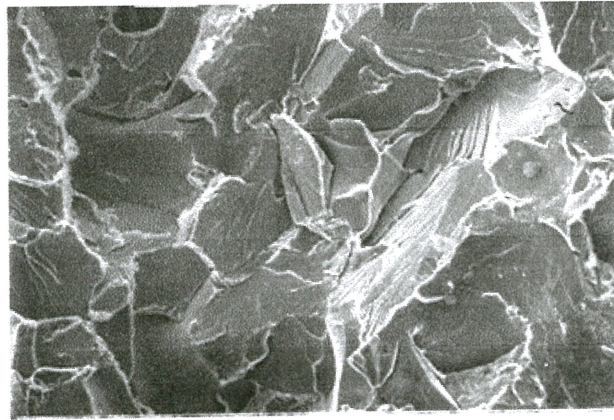


FIGURE Q4(a)



FIGURE Q4 (b)

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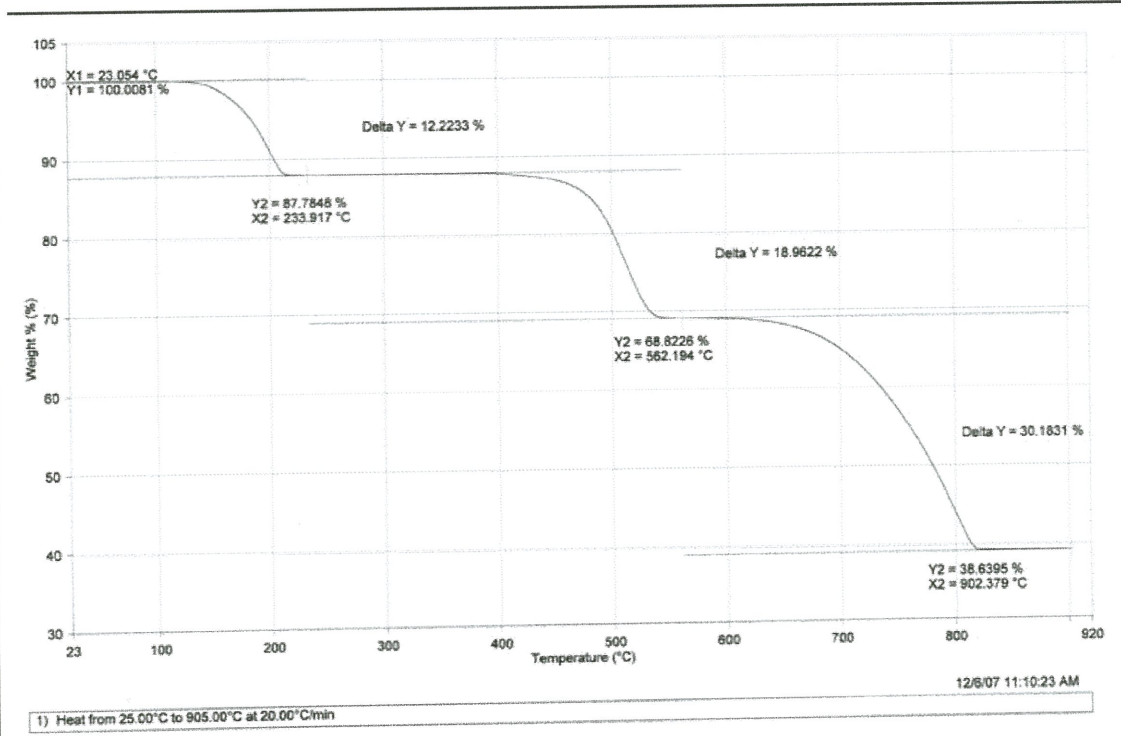


FIGURE Q5 (c)