



**UNIVERSITI KUALA LUMPUR**  
**MALAYSIA FRANCE INSTITUTE**

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**FINAL EXAMINATION**  
**SEPTEMBER 2014 SESSION**

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**SUBJECT CODE** : FWB34303  
**SUBJECT TITLE** : NON DESTRUCTIVE TESTING  
**LEVEL** : BACHELOR  
**TIME/DURATION** : 9.00 AM – 11.30 AM  
(2.5 HOURS)  
**DATE** : 2 JANUARY 2015

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**INSTRUCTIONS TO CANDIDATES**

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1. Please read the instructions given in the question paper CAREFULLY.
  2. This question paper is printed on both sides of the paper.
  3. Please write your answers on the answer booklet provided.
  4. Answer should be written in blue or black ink except for sketching, graphic and illustration.
  5. This question paper consists of Sections A and B. Answer ALL question in Section A and FOUR (4) questions in Section B.
  6. Answer all questions in English.
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THERE ARE 4 PRINTED PAGES OF QUESTIONS, EXCLUDING THIS PAGE

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**SECTION A (Total: 40 marks)****INSTRUCTION: Answer ALL questions****Please use the answer booklet provided.****Question 1**

Non-destructive testing (NDT) is the art and science of diagnosing defect in engineering structures and components without causing damage on its intended usefulness or continuing service. Give FOUR reasons on the importance of NDT in industry.

(5 marks)

**Question 2**

Successful and consistent application of non-destructive testing techniques depends heavily on personal training. Describe briefly, the duties and tasks of Level 2 personnel, in terms of qualification of certification of Non Destructive (NDT) system according to the ISO 9712.

(5 marks)

**Question 3**

Radiation detection and measurement are part of radiological monitoring in safety of Industrial radiography. Illustrate the main purpose of personnel monitoring in radiation safety.

(10 marks)

**Question 4**

Liquid penetrant testing(LPT) technique is normally used during in-service inspection. Why do we need pre-cleaning in liquid penetrant testing.

(5 marks)

**Question 5**

To understand the phenomena of sound waves in ultrasonic testing we must know the behavior of sound beam material. Sketch and label the ultrasonic beam spread in the material.

(10 marks)

**Question 6**

Magnetic particle testing (MT) is a non-destructive testing method for detecting surface and subsurface discontinuities in ferromagnetic. Why do we need to demagnetize after inspection.

(5 marks)

**SECTION B (Total: 60 marks)****INSTRUCTIONS: Answer FOUR (4) questions only.****Please use the answer booklet provided.****Question 1**

- i) Explain briefly the importance of couplant in ultrasonic testing?  
(5 marks)
- ii) The result of ultrasonic testing can be presented in various forms. Illustrate ultrasonic data presentation for the following.  
(5 marks)
- a. B-Scan
  - b. C-Scan
- iii) All the NDT techniques applied in industry have advantages and limitations. Explain the limitations of ultrasonic testing.  
(5 marks)

**Question 2**

In industry, the Eddy Current (ET) method is normally use for inspection on conductive material.

- i) Illustrate the principle of Eddy Current (ET) in material inspection?  
(5 marks)
- ii) Explain the depth of penetration or the skin depth in Eddy Current (ET). You may use sketches to facilitate your explanation  
(5 marks)
- iii) What are the limitations of Eddy Current (ET)?  
(5 marks)

**Question 3**

The main requirement to generate x-ray source for industrial radiography technique are the source of electron, an accelerating electron and a heavy element target.

- i) Explain the importance of quantity and quality of intensity of x-ray beam. (6 marks)
- ii) Describe the factors affecting radiographic quality. (6 marks)
- iii) What are the disadvantages of industrial radiographic techniques? (3 Marks)

**Question 4**

Infrared Thermography (IRT) method used as a non-destructive testing is to detect subsurface defects on the temperature differences observed on the investigated surface

- (a) Discuss briefly the emissivity in Infrared Thermography (IRT) technique (2 marks)
- (b) Describe the differences between passive and transient Infrared Thermography (IRT) (8 marks)
- (c) What are the advantages of this techniques (5 marks)

**Question 5**

Digital Industrial Radiography (DIR) is a method that uses digital technology instead of traditional photographic film. The advantages include time efficiency through by passing chemical processing and the ability to digitally transfer and enhance images. Also less radiation can be used to produce an image of similar contrast to conventional radiography.

- i) There are three types of classification in Digital Industrial Radiography (DIR) system being used. Illustrate the basic principle and the advantages for each system. (7 marks)

- ii) Describe the differences of radiographic parameters between conventional industrial radiography (RT) and digital radiography.

(8 marks)

### Question 6

The Acoustic Emission (AE) method in NDT is based on the generation of transient elastic waves during the rapid release of energy from localized sources within a material. The source of these emissions in metals is closely associated with the dislocation movement accompanying plastic deformation and the initiation and extension of cracks in a structure under stress.

- i) Illustrate the continuous energy in Acoustic Emission (AE).

(3 marks)

- ii) Sketch and discuss briefly a typical acoustic emission signal parameters used for interpretation?

(6 marks)

- iii) What are the limitations of Acoustic Emission (AE)?

(6 marks)

**END OF QUESTIONS**