



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

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

- COURSE NAME : APPLIED NON-DESTRUCTIVE TESTING
- COURSE CODE : BDC 41203
- PROGRAMME CODE : BDD
- EXAMINATION DATE : JULY 2024
- DURATION : 3 HOURS
- INSTRUCTIONS :
1. PART A: ANSWER ALL QUESTIONS.  
PART B: ANSWER **THREE (3)** FROM FOUR (4) 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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**PART A: ANSWER ALL QUESTIONS.**

**Q1** Industrial radiographers are amongst the most highly exposed group of persons who are occupationally exposed to ionising radiation during Radiography Testing (RT).

(a) Evaluate and discuss general accidents that can occur during the execution of RT to the industrial radiographers.

(15 marks)

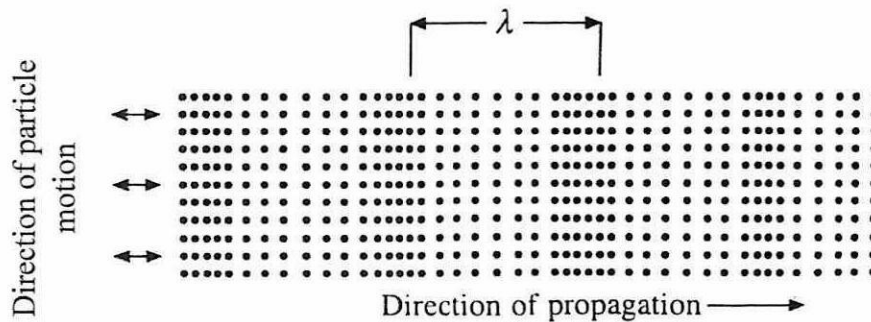
(b) A 10 year old boy in Mexico found a Cobalt 60 source in a field at the end of March, 1962, carried the unshielded source in his pocket for several days after which it was placed in a cabinet in the kitchen of his home. It remained there until recovered by its owner on 22<sup>nd</sup> July, 1962. Discuss five possible diseases that the boy and his family; mother, father, sister and grandmother, would suffer.

(5 marks)

**Q2** Ultrasonic Testing (UT) utilizes high frequency acoustic waves generated by piezoelectric transducers. Frequencies from 1 MHz to 10 MHz are typically used, although lower or higher ranges are sometimes required for certain applications.

(a) Ultrasonic waves are classified on the basis of the mode of vibration of the particles of the medium with respect to the direction of propagation of the waves. **Figure Q2.1** shows schematic diagram of waves that frequently applied for UT application. Please evaluate each figure by giving their names and defend your answer by explaining in detail the characteristics of each wave.

(10 marks)



(a)

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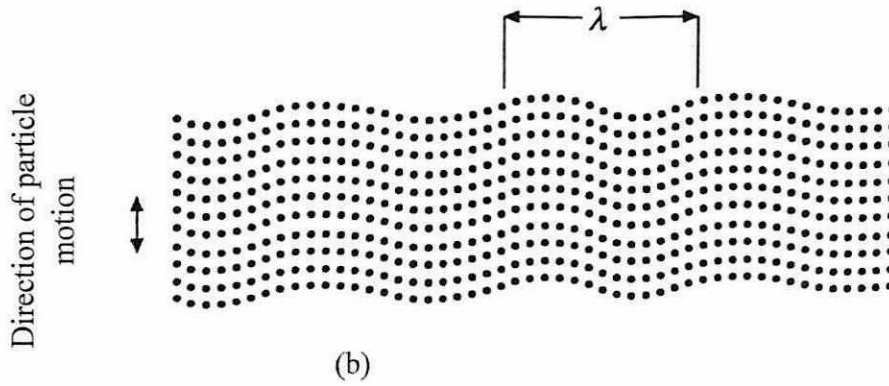
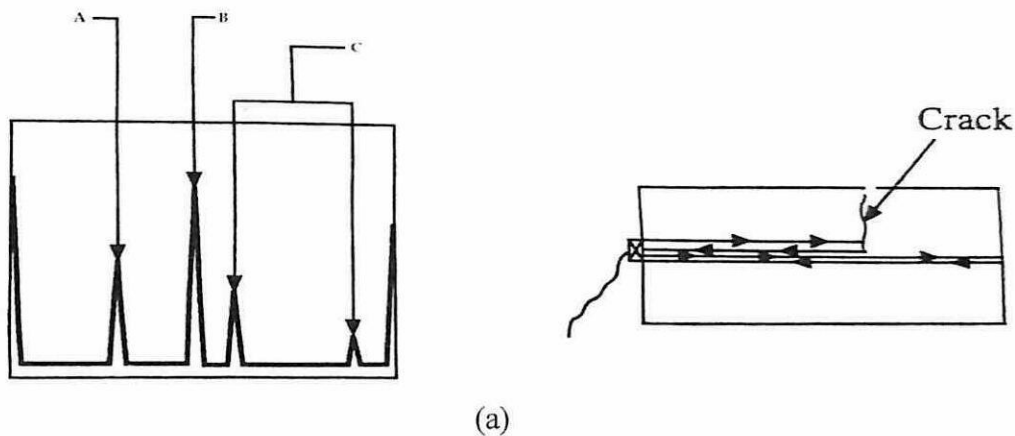


Figure Q2.1 Type of waves in UT

- (b) Acoustic Emission (AE) is the phenomenon of radiation of acoustic (elastic) waves in solids that occurs when a material undergoes irreversible changes in its internal structure. What is the difference between UT and AE in term of basic concept, as we know that both methods are based on acoustic waves in detecting flaw/discontinuities?
- (5 marks)
- (c) **Figure Q2.2(a)** shows the normal beam testing of bars of fatigue cracks whereas **Figure Q2.2(b)** shows the screens appearance and the general reflection behaviour of such defects. Please give possible answers for A, B, C, D and E as shown in both figures.

(5 marks)



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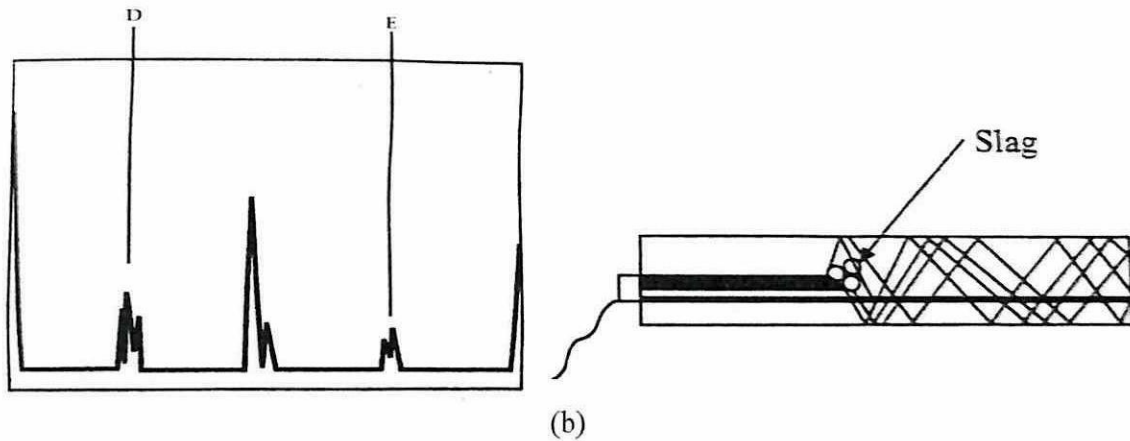


Figure Q2.2 Signal appear during UT testing method

**PART B: ANSWER THREE (3) QUESTIONS ONLY.**

**Q3** Liquid Penetrant Testing (LPT) depends mainly on the ability of liquid to wet the surface of a solid work piece or specimen and flow over that surface to form continuous and reasonably uniform coating. Thus, it is penetrating into cavities that are open to the surface.

(a) The ability of a given liquid to flow over a surface and enter surface cavities mainly depends on the surface tension and capillary action. Please explain the definition of capillary action and give two natural phenomenon that best describe the application of capillary action

(5 marks)

(b) Please justify the correct order in practising LPT on welding sample. You can provide some sketches in supporting your answer.

(15 marks)

**Q4** Magnetic particle testing (MPT) is used for the testing of materials (ferromagnetic materials) which can be easily magnetised. This method is capable of detecting flaws open-to-surface and just below the surface. The essential requirements for any test are the application of magnetic field (flux flow) of adequate intensity along a known direction in the component. There are various techniques available for magnetizing a component. Please state all techniques for magnetizing and discuss in detail about each of the technique with suitable sketches.

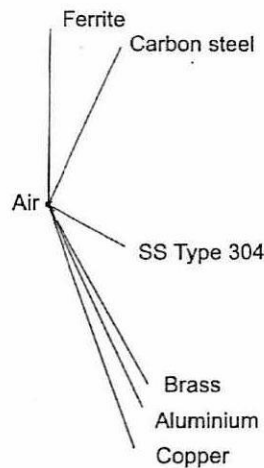
(20 marks)

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**Q5** Eddy Current Testing (ECT) is used to measure or identify such properties as electrical conductivity, magnetic permeability, the thickness of non-conductive coating, and others.

- (a) The common notation widely practiced in ECT for conductivity is Percent IACS (International Annealed Copper Standard). It indicates the relative electrical conductivity of a material as compared to that of copper. **Figure Q5.1** depicts signal arise during conductivity test. Based on the figure, please provide the %IACS for each of the material.

(5 marks)



**Figure Q5.1** Signal when surface probe coil is placed over test objects during conductivity test

- (b) ECT can be influenced due to several factors. Evaluate each factor with detail explanation. You may add sketch to your explanation, if relevant.

(15 marks)

**Q6** (a) Code and standard are crucially important for NDT certification and is practicing worldwide. Please defend this statement with your own word. Provide some examples of NDT certification that available in Malaysia with the standard that they comply with. Also, please verify which standard is required for execution of visual inspection testing.

(15 marks)

- (b) What is the general stage to become NDT inspector which practising worldwide?

(5 marks)

- END OF QUESTIONS -

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