



**UNIVERSITI TUN HUSSEIN ONN MALAYSIA**

**FINAL EXAMINATION  
(ONLINE)  
SEMESTER II  
SESSION 2020/2021**

COURSE NAME : APPLIED NON-DESTRUCTIVE TESTING

COURSE CODE : BDC 41203

PROGRAMME CODE : BDD

EXAMINATION DATE : JULY 2021

DURATION : 3 HOURS

INSTRUCTION : PART A: ANSWER ALL QUESTION  
PART B: ANSWER **THREE (3)**  
QUESTIONS **ONLY**

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

**PART A (COMPULSORY)**

Answer **ALL** questions.

**Q1** (a) There are several types of weld defect. Differentiate **four (4)** weld defects that commonly occur in carbon steel single Vee butt joint. Your explanation should include figure with label, factor and causes as well.

(8 marks)

(b) You are one of the NDT engineering team in Sapura Energy Berhad that have been asked to perform visual inspection on pressure vessel as shown in **Figure Q1(b)**. Draft a Visual Testing (VT) report based on BS EN ISO 17637-2011 and SNT-TC-1A, 2011. The draft report should include **six (6)** criteria as below;

- (i) How visual examination is to be performed
- (ii) Type of surface conditions available
- (iii) Method or tools for surface preparation, if any
- (iv) Whether direct or remote viewing is used
- (v) Special illumination, instruments, or equipment to be used, if any
- (vi) Report forms to be completed

(12 marks)

**Q2** (a) After attending Applied NDT elective course in UTHM, you might be are interested to become a qualified and certified NDT engineer. Explain the benefits of NDT engineer with your planned career path. You may use diagram, code of standard or certification to support your explanation.

(10 marks)

(b) In manufacturing process, there are **three (3)** stages of inspections. Discriminate each NDT inspection technique based on principles, application, advantages and limitation of each NDT methods.

(10 marks)

**TERBUKA**

**PART B (OPTIONAL)**

Answer **THREE (3)** Questions **ONLY**.

**Q3** (a) There are several considerations when deciding upon best Magnetic Particle Testing (MT) method. Distinguish **four (4)** best options to support your answer with an appropriate diagram and code of standard.

(8 marks)

(b) You are inspecting a 1.5 inches diameter round bar with a total length of 9 inches using a five-turn coil with an internal diameter (ID) of 12 inches.

(i) Examine whether the coil is a low fill factor by comparing area ratios.

(2 marks)

(ii) Based on the **Q3(b)(i)**, evaluate the ampere to be used if the part is positioned in both side and centrally in coil?

(10 marks)

**Q4** (a) As NDT inspector in Crescent NDT & Inspection Sdn Bhd, your recent project is to identify the surface defect on weld structure using Penetrant Testing (PT) technique. Discuss and propose the best technique with supportive figures.

(10 marks)

(b) Based on the **Q4(a)**, what are the most critical stage to be carefully conducted? Justify your explanation with an appropriate code and specification.

(10 marks)

**Q5** **Figure Q5(a)(i)** and **Figure Q5(a)(ii)** shows the test instruction and Radiographic Testing (RT) inspection image from circumferential butt weld joining pipe to body valve. Based on the above information, design suitable RT examination report accordance to PN-EN 1435.

(20 marks)

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- Q6** (a) Danamin (M) Sdn Bhd, one of the biggest NDT service provider company in Malaysia want to dispose their analog UT flaw detector unit. Compare both analog and digital UT flaw detector unit in term of their control function and limitation in detecting the discontinuities. You may use an appropriate block diagram to support your explanation.

(8 marks)

- (b) **Figure Q6(b)** shows the reflection and refraction angle as stated in the Snell's law. Based on your understanding regarding this phenomenon;

- (i) Prove that air is worse than water to be used as transmission medium for non-contact UT technique. Use the percentage energy reflected calculation as evidence to support your explanation. Given that the acoustic impedance of steel,  $Z_{\text{steel}} = 46.7$ ; acoustic impedance of water,  $Z_{\text{water}} = 1.48$  and acoustic impedance of air,  $Z_{\text{air}} = 0.0004$ .

(6 marks)

- (ii) Why the refraction angle of compression wave is higher than shear wave? Justify your answer with Snell's law equation.

(6 marks)

– END OF QUESTIONS –

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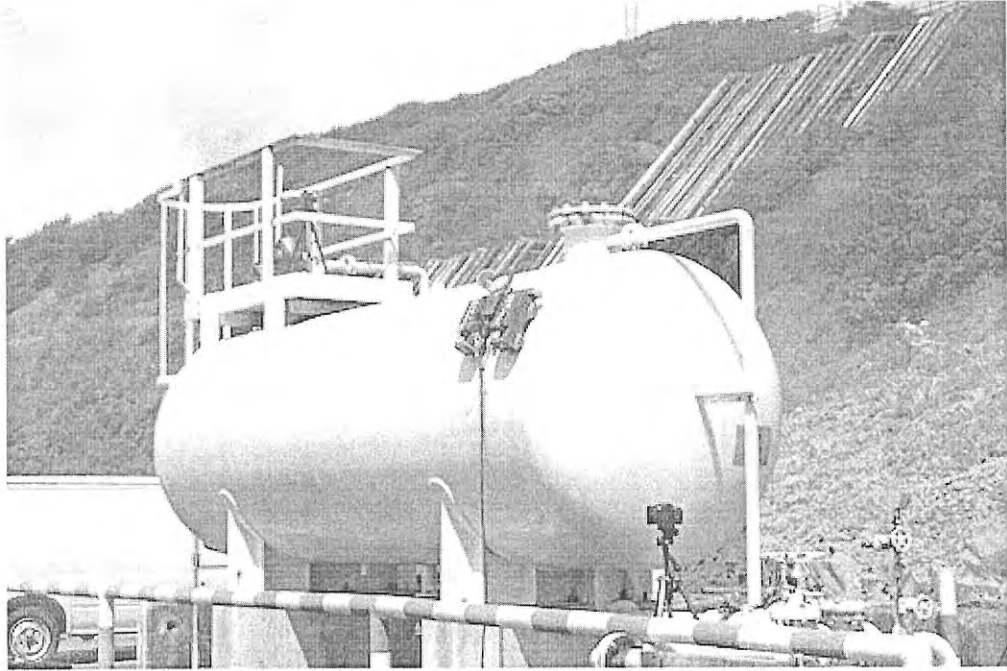
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**Figure Q1(b)**

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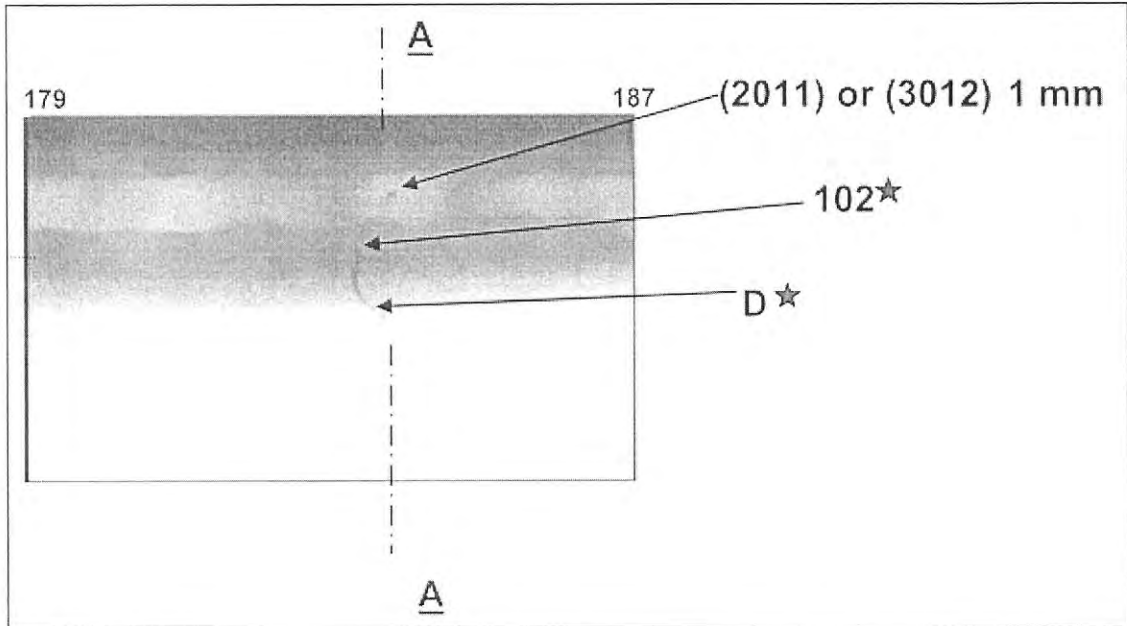


Figure Q5(a)(ii)

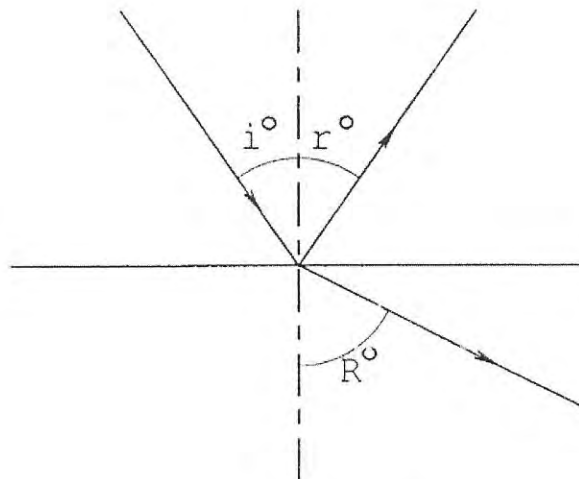


Figure Q6(b)

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