Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2022/2023

COURSE NAME	:	APPLIED NON-DESTRUCTIVE TESTING
COURSE CODE	:	BDC 41203
PROGRAMME CODE	:	BDD
EXAMINATION DATE	:	FEBRUARY 2023
DURATION	:	3 HOURS
INSTRUCTION	:	(1) PART A: ANSWER **ALL** QUESTIONS AND PART B: ANSWER **FOUR (4)** QUESTIONS **ONLY**
		(3) THIS FINAL EXAMINATION IS CONDUCTED VIA **CLOSED BOOK**
		(4) STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK

THIS QUESTION PAPER CONSISTS OF **EIGHT (8)** PAGES

PART A: ANSWER ALL QUESTIONS.

Q1 (a) Danamin (M) Sdn. Bhd., one of the biggest NDT service provider company in Malaysia plans to replace their analog UT flaw detector unit to a digital unit. As an NDT engineer, you are asked to compare both analog and digital UT flaw detector units in term of their control function and limitation in detecting the discontinuities to the company for top management decision. You may use an appropriate block diagram to support your explanation.

(8 marks)

(b) **Figure Q1** shows the reflection and refraction angle as stated in Snell's Law. Based on your understanding regarding this phenomenon;

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

(6 marks)

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

(6 marks)

PART B: ANSWER FOUR (4) QUESTIONS ONLY.

Q2 (a) Differentiate between the certification under ISO 9712 with non ISO 9712 practice. The answer should include the appropriate flow chart, figures and implications between those two scenarios.

(10 marks)

(b) In the manufacturing process, there are **THREE (3)** stages of NDT inspections. Differentiate each NDT inspection technique or stage based on principles, application, advantages and limitation of each NDT method.

(10 marks)

Q3 (a) **Figure Q3(a)** shows the 20 cm steel single Vee butt joint welded plate with **FOUR (4)** welded defects. Report your finding in technical report format as in **Figure Q3(b)**.

(12 marks)

(b) Based on your answer in **Q3(a)**, differentiate **FOUR (4)** weld defects that commonly occur in carbon steel single Vee butt joint. Your explanation should include the figure with an appropriate level, factor and causes as well.

(8 marks)

Q4 (a) **Figure Q4** shows one of the Magnetic Particle Testing (MPT) known as the Central Conductor Technique. Differentiate **FOUR (4)** techniques that can be used to inspect parts using the Central Conductor Technique with an appropriate element of consideration.

(10 marks)

(b) You are inspecting 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) Determine whether the coil is a low fill factor by comparing area ratios.

(2 marks)

(ii) Based on the **Q4(b)(i)**, evaluate the Ampere to be used if the part is positioned in both sides and centrally in coil?

(8 marks)

Q5 (a) **Figure Q5** shows an NDT Personnel is performing the Dye Penetrant Testing (PT) on a pipeline. Based on the principle of PT, why the personnel did not use fluorescent while performing this testing?

(4 marks)

(b) As an NDT inspector in Crescent NDT & Inspection Sdn. Bhd., your recent project is to identify the surface defect on weld structure using the PT technique. Propose the best technique with respect to the critical stage of PT with supportive figures or chart.

(16 marks)

Q6 (a) **Figure Q6(a)** shows three NDT personals were conducting the Radiography Testing (RT) in a working area. Based on the radiation safety, discuss the element to comply during conducting RT. Then, identify any obligation that occurs as referred to **Figure Q6(a)**. Your answer may include exposure control, radiation protection and shielding elements.

(12 marks)

(b) Figure Q6(b) shows the RT image of welded steel material. Interpret all the defects and discuss the defects criteria and root cause.

(8 marks)

– END OF QUESTION –

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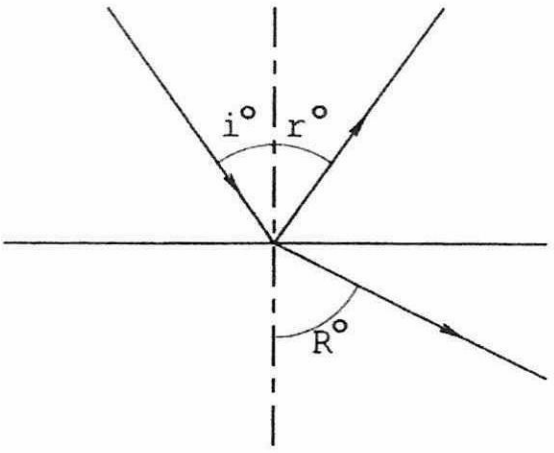

Figure Q1

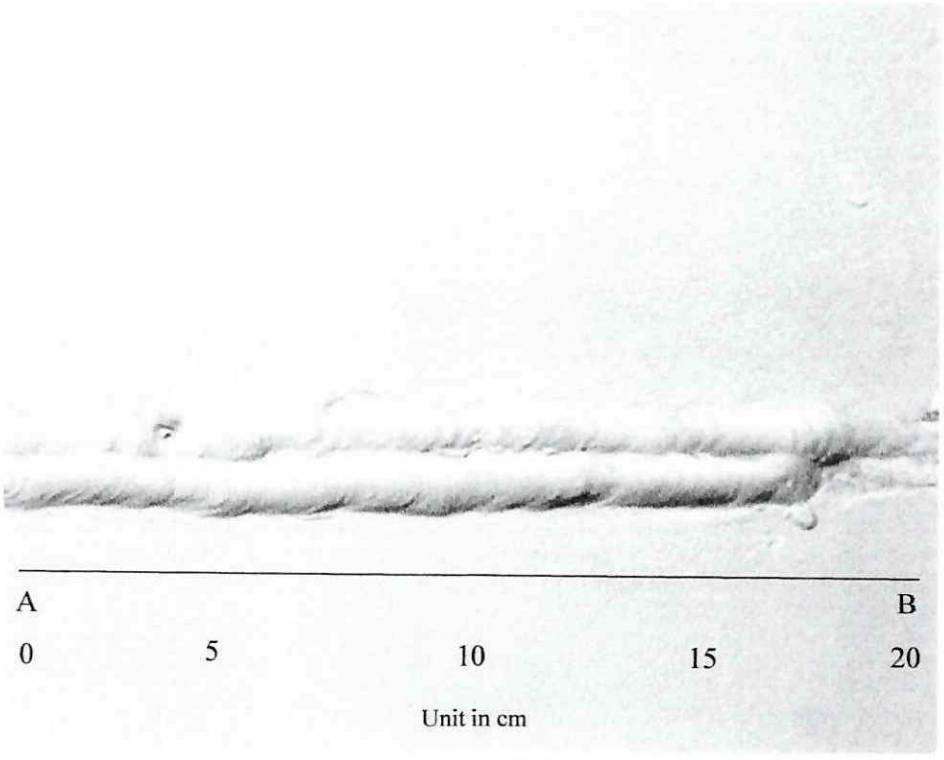

Figure Q3(a)

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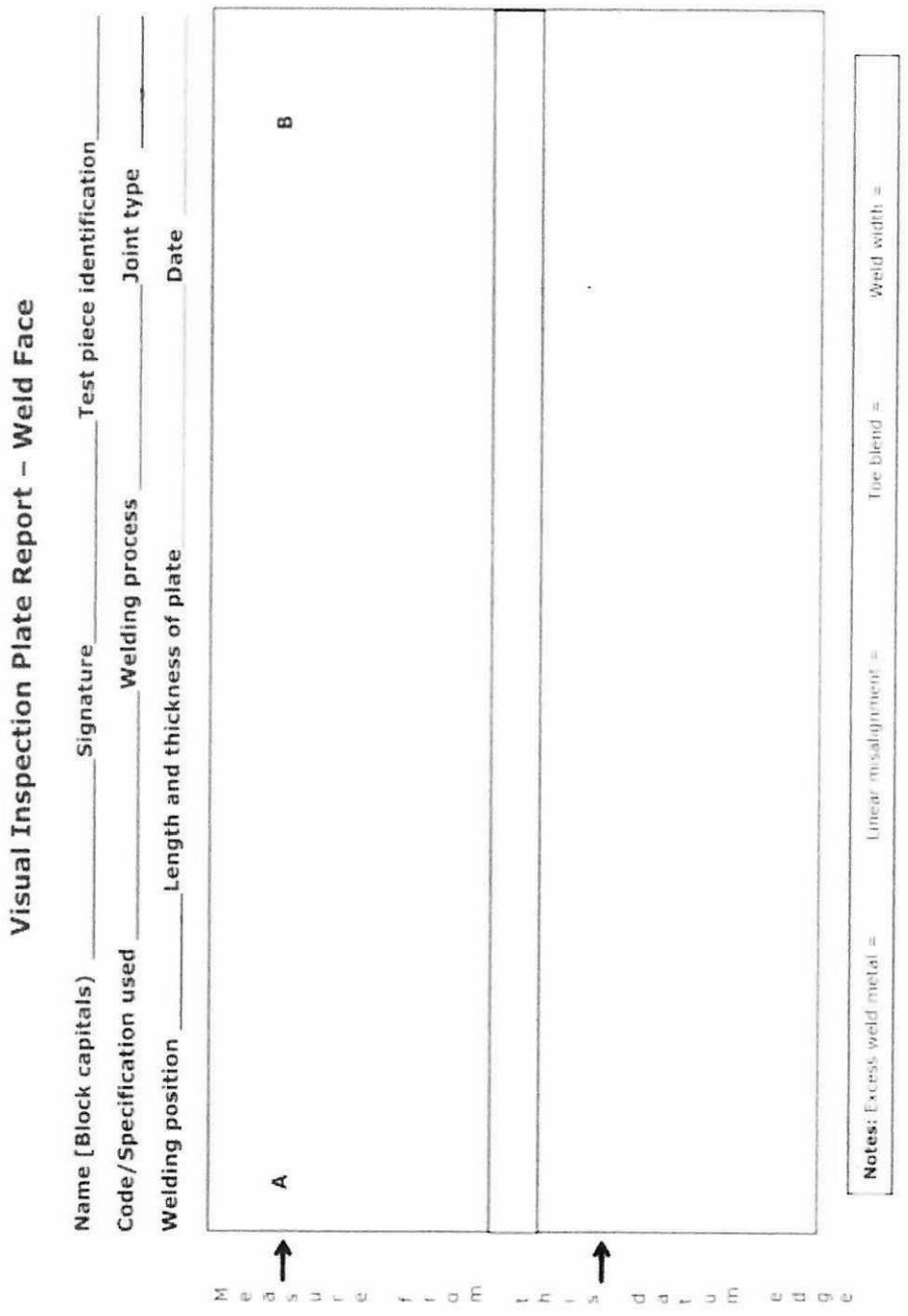

Figure Q3(b)

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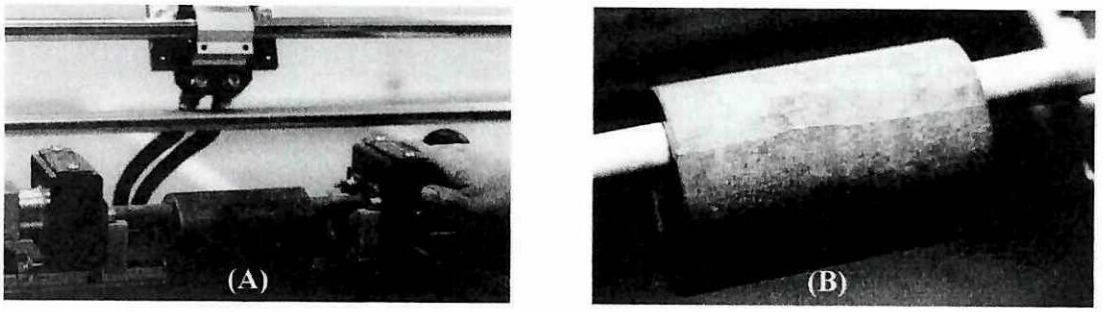

Figure Q4

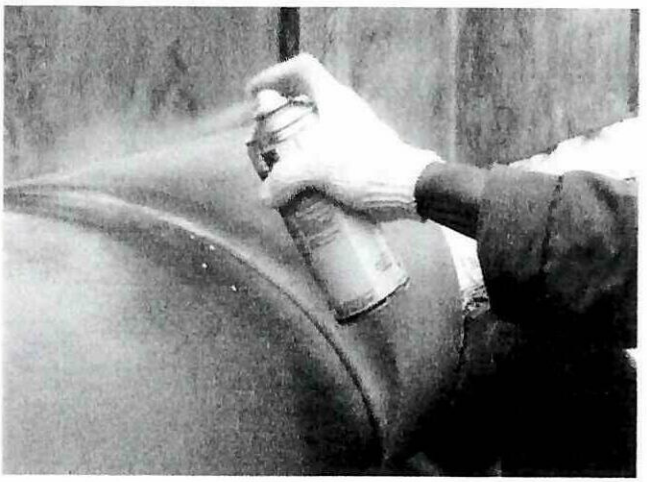

Figure Q5

Figure Q6(a)

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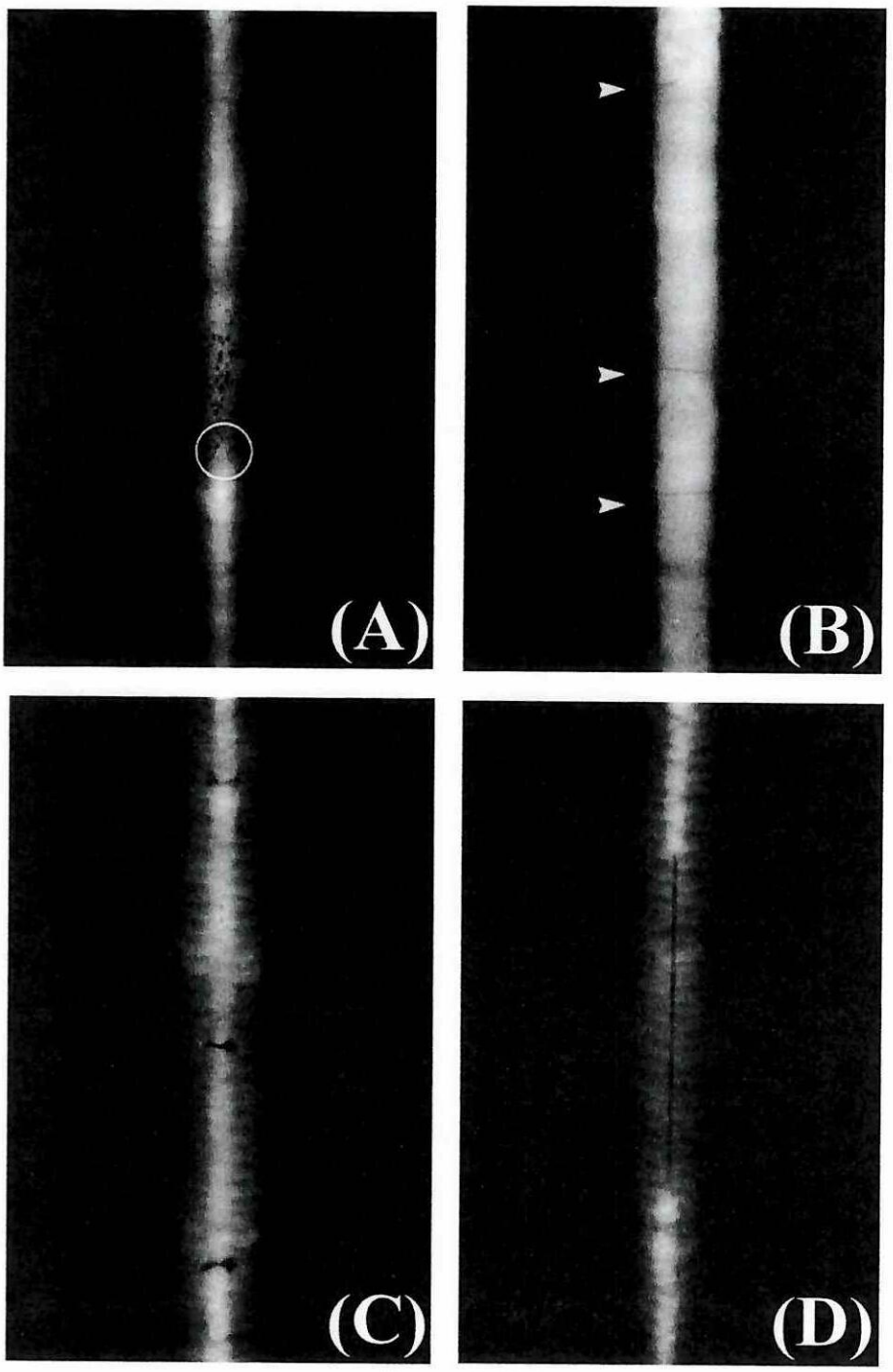

Figure Q6(b)