



UNIVERSITY OF RUHUNA

Faculty of Engineering

End-Semester 8 Examination in Engineering: January 2026

Module Number: ME 8212

Module Name: Non Destructive Testing Applications

[Three Hours]

[Answer all questions; each question carries twelve marks]

Q1.

- a) Briefly explain the importance of Non Destructive Testing (NDT) in Industrial Engineering applications. [2.0 Marks]
- b) State **four** purposes of performing NDT in real world applications. [4.0 Marks]
- c) Discuss the importance of surface pre cleaning in Liquid Penetrant Testing (LPT). [3.0 Marks]
- d) List out the important steps in Liquid Penetrant Testing (LPT). [3.0 Marks]

Q2.

- a) Briefly describe the formation of **magnetic dipoles** in a certain material. [2.0 Marks]
- b) Define the following terms as applicable for the process of **Magnetization** and write down the SI units of each quantity.
 - i) Magnetic field strength
 - ii) Magnetic moment
 - iii) Magnetization
 - iv) Magnetic Flux Density[6.0 Marks]
- c) Depict the magnetization and demagnetization of **ferromagnetic, ferrimagnetic, antiferromagnetic, paramagnetic** and **diamagnetic** materials with the aid of a suitable MH curve. [2.0 Marks]
- d) Describe how to inspect the quality of a welded joint with the aid of Eddy Current Testing (ECT). (Include only the results and analysis. Procedure is not required) [2.0 Marks]

- Q3. a) Describe the theory of Magnetic Particle Testing (MPT). [3.0 Marks]
- b) "A defected region of a ferromagnetic material can be considered as a magnetic pole in MPT". Briefly discuss this statement. [2.0 Marks]
- c) Define the following terms relevant to different magnetization mechanisms.
- i) Direct magnetization
 - ii) Indirect magnetization
 - iii) Longitudinal magnetization
 - iv) Circular magnetization
- [4.0 Marks]
- d) Define the terms **Remanence** and **Coercivity** as applicable for demagnetization and describe why demagnetization is required in MPT. [3.0 Marks]
- Q4. a) What is 6 dB drop method used in ultrasound testing (UT)? [2.0 Marks]
- b) Write the step-by-step procedure of detecting of defect size by 6 dB drop method. [3.0 Marks]
- c) What are the different calibration blocks available in UT? When they are used? Explain using examples. [3.0 Marks]
- d) What is the penumbra effect observed in X-ray testing of materials? [2.0 Marks]
- e) Provide a suggestion to minimize the penumbra effect. [2.0 Marks]
- Q5 The weld depicted in Figure Q5-A is to be examined using ultrasonic testing with the pulse-echo technique. A 70° angle probe is employed, and the screen range is calibrated to 250 mm. The echo pattern recorded at the probe position indicated is shown in Figure Q5-B.
- a) Determine the full skip beam path length and full skip distance. [3.0 Marks]
- b) Describe the correct process of screen calibration to 250 mm. [3.0 Marks]
- c) Interpret the echo pattern and determine the location and type of any discontinuities present in the weld. [3.0 Marks]
- d) Comment on the suitability of the probe angle for detecting potential lack of fusion defects in this weld configuration. [3.0 Marks]

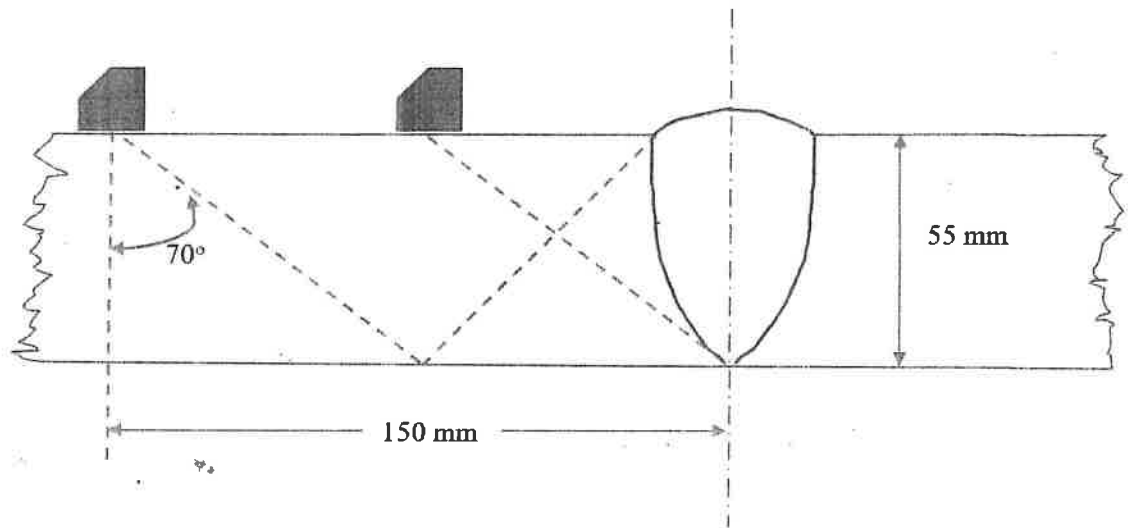


Figure Q5-A

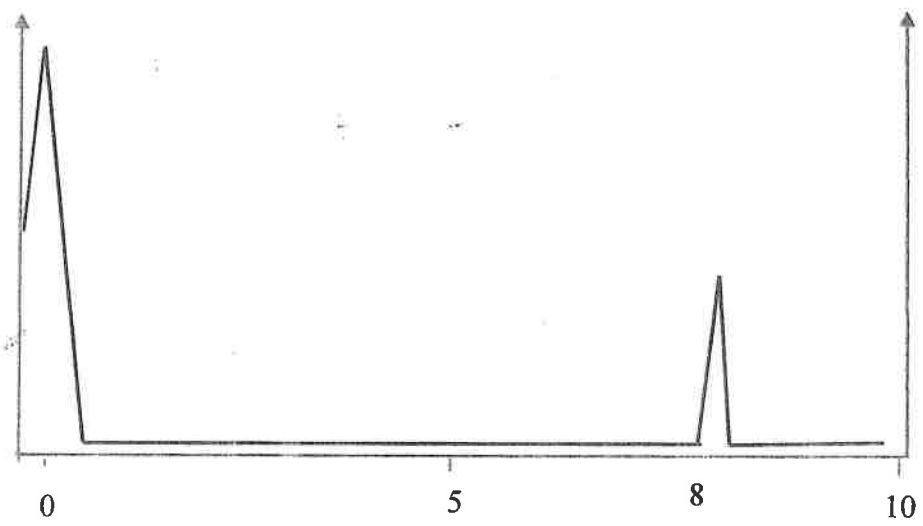


Figure Q5-B