Questions and Answers for an Ultrasonic Testing (UT)

1. What is Ultrasonic Testing (UT)? UT is a non-destructive testing technique that uses high-frequency sound waves to detect internal flaws or measure material thickness.

2. What is the primary purpose of UT? The primary purpose is to detect and characterize defects in materials.

3. Define the term "transducer" in UT A transducer is a device that converts electrical energy into ultrasonic sound waves and vice versa.

4. What is frequency? and the typical frequency range for UT? Frequency is the number of cycles per second. The frequency range for UT is commonly between 1 MHz and 20 MHz. 1 MHz = 1,000,000 Hz

Frequency and wavelength Relation? Frequency increases, wavelength decreases. Wavelength = Velocity/Frequency

Sensitivity: The smallest detectable flaw by the system or technique. **In UT the smallest detectable flaw is ½ λ Wavelength.**

5. Explain the term "piezoelectric effect." The piezoelectric effect is the ability of certain materials to generate an electric charge in response to applied mechanical stress and vice versa. Piezoelectric transducers are used for converting electrical pulses to mechanical vibrations and vice versa.

6. What is the purpose of coupling in UT? Coupling is necessary to ensure efficient transfer of ultrasonic waves between the transducer and the material being tested.

7. How does UT differentiate between materials? UT relies on differences in acoustic impedance to distinguish between materials and identify discontinuities.

8. What is term for time taken by ultrasonic pulse to travel through a material? It is called "transit time" or "time of flight."

9. Explain the term "near field" in UT. The near field is the region close to the transducer where the ultrasonic beam is still converging and hasn't fully developed its characteristics.

10. Why is a reference block used in UT calibration? A reference block is used to calibrate and standardize the ultrasonic equipment, ensuring accurate and reliable results.

11. Define the term "beam spread" in UT. Beam spread refers to the widening of the ultrasonic beam as it travels deeper into the material.

12. What is the purpose of the "gain" control in UT? Gain control adjusts the amplification of the received signal, allowing for the detection of small or distant flaws.

13. Explain the term "dead zone" in UT. The dead zone is the initial distance from the transducer where accurate flaw detection is challenging due to the near field effects.

14. What is the purpose of a "DAC" (Distance Amplitude Correction) in UT? DAC corrects for amplitude variations with depth in the material, providing a more accurate representation of flaw size.

15. Why is a water column often used in immersion testing? A water column provides an acoustic coupling medium for immersion testing, ensuring efficient transmission of ultrasonic waves.

16. What is the difference between pulse-echo and through-transmission testing? Pulse-echo involves a single transducer both transmitting and receiving, while through-transmission uses separate transducers for transmission and reception.

17. Define "resolution" in UT. Resolution is the ability of the UT system to distinguish between two adjacent reflectors.

18. What is the purpose of a delay line in UT? A delay line introduces a time delay between the initial pulse and the arrival of the ultrasonic waves at the transducer, facilitating the inspection of thin materials.

19. Explain the term "backwall echo" in UT. The back wall echo is the reflection of ultrasonic waves from the far side of the material, used as a reference for calibration.

20. What is the significance of the term "angle beam" in UT? Angle beam testing involves directing ultrasonic waves at an angle to the surface for improved flaw detection in welds and other components.

21. Define the term "mode conversion" in UT. Mode conversion occurs when ultrasonic waves change from one mode to another at interfaces between materials with different acoustic properties.

22. How is the depth of a flaw determined in UT? The depth of a flaw is often determined by measuring the time taken for ultrasonic waves to travel to and from the flaw.

23. What is the purpose of a "wedge" in UT? A wedge is used to introduce an angle between the transducer and the test surface, allowing for better penetration in materials with a high acoustic impedance.

24. Explain the term "snail trail" in UT. A snail trail is a visual representation of the movement of a flaw, often observed on the screen during scanning.

25. Why is it essential to consider the grain structure in UT? Grain structure affects the propagation and reflection of ultrasonic waves, influencing the accuracy of flaw detection.

26. What is the purpose of a "straight beam" probe in UT? A straight beam probe is used for direct, perpendicular sound wave penetration into a material for detecting internal flaws.

27. Define the term "attenuation" in UT. Attenuation is the decrease in amplitude and energy of ultrasonic waves as they travel through a material.

28. What is the primary advantage of phased array ultrasonics? Phased array allows for electronic control of the beam angle and focal point, improving inspection flexibility and accuracy.

29. Why is surface roughness a consideration in UT? Surface roughness can scatter and absorb ultrasonic waves, affecting the accuracy of flaw detection.

30. Explain the term "multipath interference" in UT. Multipath interference occurs when ultrasonic waves take multiple paths through a material, leading to interference and potential inaccuracies in flaw detection.

31. What is the purpose of a "time base" in UT displays? The time base sets the scale for the horizontal axis of the display, representing the time taken for ultrasonic waves to travel through the material.

32. How does temperature affect the velocity of ultrasonic waves? Ultrasonic wave velocity generally increases with temperature, impacting the accuracy of thickness measurements if not compensated.

33. Explain the term "refraction" in UT. Refraction occurs when ultrasonic waves change direction as they pass through a material with varying acoustic properties.

34. What is the purpose of a "thickness gauge" in UT? A thickness gauge measures the thickness of a material by determining the time taken for ultrasonic waves to travel through it.

35. Why is UT often used in weld inspection? UT is sensitive to weld defects and can provide detailed information about their size, shape, and location.

36. Define the term "nodularity" in UT. Nodularity refers to the presence of nodules or rounded features in a material, affecting the ultrasonic wave reflection.

37. What is the significance of the term "acoustic impedance" in UT? Acoustic impedance is a measure of the resistance of a material to the transmission of ultrasonic waves and influences the amount of wave reflection.

38. Explain the term "angle probe" in UT. An angle probe is a transducer designed to introduce an angled beam into a material for improved flaw detection in specific applications.

39. What is the purpose of a "traverse" in UT scanning? A traverse is a systematic movement of the transducer over the surface of a material to inspect a larger area for defects.

40. Define the term "ultrasonic attenuation coefficient." The ultrasonic attenuation coefficient measures the rate at which ultrasonic waves decrease in intensity as they travel through a material.

41. How does the density of a material affect ultrasonic wave velocity? Generally, higher-density materials have higher ultrasonic wave velocities.

42. What is purpose of a "pulser" in UT equip? Pulser generates the initial ultrasonic pulse, initiating the inspection process.

43. Explain the term "compression wave" in UT. A compression wave, also known as a longitudinal or pressure wave, is a type of ultrasonic wave where particles move in the direction of wave propagation.

44. How does the size of a flaw affect the amplitude of the reflected signal? Larger flaws typically produce stronger reflected signals, making them easier to detect.

45. What is the purpose of a "sensitivity control" in UT? Sensitivity control adjusts the instrument's sensitivity to detect small or large flaws, ensuring optimal performance.

46. Define the term "refracted angle" in UT. The refracted angle is the angle at which an ultrasonic wave changes direction upon entering a material with a different acoustic impedance.

47. How does grain orientation impact ultrasonic wave velocity? Ultrasonic wave velocity can vary with grain orientation, affecting the accuracy of flaw detection.

48. What is the primary limitation of UT in terms of material type? UT is most effective in homogeneous materials and may face challenges in highly attenuative or coarse-grained materials.

49. Why is a "water path" important in contact testing? A water path provides efficient acoustic coupling in contact testing, ensuring accurate transmission of ultrasonic waves into the material.

50. Explain the term "impulse excitation" in UT. Impulse excitation involves using a short-duration, high-energy ultrasonic pulse for flaw detection, commonly used in thickness measurements.

The longitudinal (LV) and shear velocities (SV) in different materials can vary based on factors like the material's density, elastic properties, and composition. Steel: LV 5900 m/s. **SV** 3200 m/s**. Aluminum: LV** 6400 m/s. **SV**: 3100 m/s**. Perspex (Acrylic): LV:** 2700 m/s**. SV:** 1200-1500 m/s**. Water:** 1480 m/s. **SV:** zero.

1ST CRITICAL ANGLE: REFRACTED LONGITUDINAL IS ANGLE 90° | **2ND CRITICAL ANGLE:** REFRACTED SHEAR ANGLE IS 90◦

Near Zone formula = D x D x f / 4 v

BANK ACCOUNT TO PAY & START COURSE

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