AUE-705A

NON-DESTRUCTIVE TESTING METHODS

Time Allotted: 3 Hours | Full Marks: 70

The questions are of equal value.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

GROUP A
(Multiple Choice Type Questions)

1. Answer *all* questions. 10×1 = 10

(i) Liquid penetrant testing is based on the principle of
(A) polarized sound waves in a liquid
(B) magnetic domains
(C) absorption of X rays
(D) capillary action

(ii) Coating thickness can be detected with the help
(A) Eddy Current Testing(E.C.T.)
(B) Liquid Penetrant Testing(L.P.T.)
(C) Visual Testing(V.T.)
(D) Radiographic Testing(R.T.)

(iii) For ultrasonic testing of a thin metallic sheet, would you opt for which method?
(A) through transmission (B) pulse echo
(C) either (D) neither

(iv) The limitation of a liquid penetrant test is
(A) only surface breaking discontinuities can be detected
(B) porous materials cannot be tested
(C) there is cleaning problem following penetrant inspection in some cases
(D) all of these

(v) For circumferential crack along the length of a steel pipe would you opt for
(A) longitudinal magnetization (B) circular magnetization
(C) either (D) neither

(vi) Which method is the best recommended method in intergranular corrosion?
(A) LPT (B) MPT
(C) ECT (D) RT
(E) UT

(vii) Magnetic particle testing is most likely to find subsurface discontinuities in:
(A) soft steels with high permeability
(B) soft steels with low permeability
(C) hardened steels with low permeability
(D) hardened steels with high permeability

(viii) Black light source is used for
(A) X-rays method (B) fluorescent penetrant method
(C) thermography (D) none of these

(ix) The maximum frequency usually used for contact ultrasonic testing is:
(A) 1 MHz (B) 5 MHz
(C) 10 MHz (D) 25 MHz

(x) NDT methods are used to inspect the service operation of product damage like
(A) rolling (B) heat treatment
(C) welding (D) corrosion

GROUP B
(Short Answer Type Questions)

Answer any *three* questions. 3×5 = 15

2. Explain with sketches the following term in ultrasonic testing-
(i) A-scan system (ii) B-scan system (iii) C-scan system
(iv) P-scan system (v) S-scan system (vi) Z-scan system

3. Write down advantages and limitations of destructive and non-destructive testing.

4. Explain, in brief, the various techniques that can be employed for the demagnetization of component after doing Magnetic particle testing.

5. (a) Explain different types of ultrasonic waves.
(b) Explain different types of transducers used ultrasonic inspection.

GROUP C
(Long Answer Type Questions)

Answer any *three* questions. 3×15 = 45

6. (a) How is the depth of penetration related to the frequency of test in case of eddy current circuit. Write down the relationship expression between these two parameters. 5+5+5
(b) Write down skin effect on eddy current testing. Compute the depth of penetration in mm for eddy current testing using the following data:
Electrical conductivity = 50mhos/m
Magnetic permeability = 4×10^{-7} Henry/m
Frequency (f) = 1 MHz
(c) What is the principle involved in eddy current inspection? Explain how current eddy can be used to analyse the remaining life of a part of corrosive pipeline?

7. (a) Write down principle of Ultra-sonic testing (U.T.). 5+5+5
(b) Give the advantage and disadvantage of Ultra-sonic testing (U.T.).

(c) Give the applications with sketches of ultrasonic inspection of products like.
(i) Casting (ii) Extrusion (iii) Rolled products (iv) Weld set
(v) Corrosion monitoring (vi) Stress measurement.

8. (a) Explain briefly the various defects developed during manufacturing process.
(b) With the neat sketch explain steps involved in liquid penetrant testing. What are the advantages, disadvantages of this method.
(c) With sketches explain how the following components are inspected using MPI?
(i) Castings and forgings
(ii) Hollow cylinder.

9. (a) Write down principle of Eddy Current Testing (E.C.T.).
(b) Give the advantage and disadvantage of Eddy Current Testing (E.C.T.).
(c) Explain how the following components are inspected using eddy current inspection.
(i) Tubes and solid cylinder
(ii) Welds in welded tubing and pipe
(iii) Aircraft structural part and engine components.

10. Write short notes on:
(a) Defect analysis.
(b) Visual/optical examination.
(c) In-service Damage inspection.