

CS/B.Tech/(AUE-New)/SEM-7/AUE-705A/2013-14

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2013

NON-DESTRUCTIVE TESTING METHODS

Time Allotted : 3 Hours

Full Marks : 70

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)

Choose the correct alternatives for the following : $10 \times 1 = 10$

- i) Which type of testing is selected to detect creep in engineering material ?
- a) Ultrasonic Testing (U.T.)
 - b) Acoustic Emission Testing (A.E.T.)
 - c) Thermography Testing (T.T.)
 - d) Magnetic Particle Testing (M.P.T.).

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[Turn over

- ii) Coating thickness can be detected with the help of
- 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) NDT methods are used to inspect in service operation of product damage like
- a) rolling
 - b) heat treatment
 - c) welding
 - d) corrosion.
- iv) 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.
- v) Low sulphur and chlorine penetrant materials would be used for testing
- a) aluminium, steel and plastics
 - b) tool steels, chrome vanadium steel and ferritic stainless steels
 - c) austenitic stainless steels, nickel alloys and titanium
 - d) magnetic materials.

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- vi) The limitation of a liquid penetrant test is
- only surface breaking discontinuities can be detected
 - porous materials cannot be tested
 - there is cleaning problem following penetrant inspection in some cases
 - all of the listed.
- vii) For circumferential crack along the length of a steel pipe would you opt for
- longitudinal magnetization
 - circular magnetization
 - either (a) or (b)
 - none of these.
- viii) Magnetic particle testing is most likely to find subsurface discontinuities in
- soft steels with high permeability
 - soft steels with low permeability
 - hardened steels with low permeability
 - hardened steels with high permeability.

- ix) Black light source is used for
- X-rays methods
 - fluorescent penetrant method
 - thermography
 - none of these.
- x) The maximum frequency usually used for contact ultrasonic testing is
- | | |
|-----------|------------|
| a) 1 MHz | b) 5 MHz |
| c) 10 MHz | d) 25 MHz. |

GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

- Write down the advantages and limitations of destructive and non-destructive testing.
- What are the procedures applied during liquid penetrant testing? Give details.
- Write the applications of NDT techniques other than flow detection.
- Explain different types of ultrasonic waves.
 - Explain different types of transducers used for ultrasonic inspection.

2 + 3

6. Explain with sketches the following terms in ultrasonic testing :
- A-scan system
 - B-scan system
 - C-scan system
 - P-scan system
 - S-scan system.

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) If there is a need to locate a surface crack running along the length of the shaft. For a detection of a radial crack in a steel shaft, which type of magnetization would you opt for ? Also which type of magnetization, would you recommend ? Show with the help of suitable figures as to how would you obtain the above mentioned magnetization(s).
- b) How will you detect flaw in a short work piece using prod type magnetic crack detector ?
- c) What is the need for demagnetization ? Explain in brief, the various techniques that can be employed for the demagnetization of component after doing MPI.

5 + 5 + 5

8. 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 :
- Tubes and solid cylinder
 - Welds in welded tubing and pipe
 - Aircraft structural part and engine components.

5 + 5 + 5

9. 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.
- b) Compute the depth of penetration in mm for eddy current testing using the following data :
- Electrical conductivity = 5 mhos/m,
- Magnetic permeability = 4×10^{-7} Henry/m,
- Frequency (f) = 1 MHz.
- c) What is the principle involved in Eddy Current inspection ? Explain how Eddy Current can be used to analyse the remaining life of a part of corrosive pipeline ?

5 + 5 + 5

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10. a) Give the advantage and disadvantage of Acoustic Emission Testing (A.E.T.)
- b) Give the advantage and disadvantage of Thermography Testing (T.T.)
- c) Give the applications of T.T. and A.E.T. 5 + 5 + 5

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