

## **CONTENTS**

---

### **UNIT - 1 : OVERVIEW OF NDT..... 1.1-1.77**

1.1.	Introduction .....	1.1
1.2.	Introduction to Materials Testing .....	1.3
1.3.	Classification of Materials Tests .....	1.5
1.4.	Overview of Destructive Tests .....	1.13
1.5.	Overview of Non-Destructive Testing Methods.....	1.23
1.6.	Comparison of Various NDT Methods .....	1.45
1.7.	Engineering Brief on Discontinuities .....	1.52
1.8.	Selection of NDT Methods.....	1.61
1.9.	Visual Inspection - Introduction .....	1.63
1.10.	Basic Principle of Visual Inspection .....	1.64
1.11.	Types of Visual Testing.....	1.65
1.12.	Equipment used in Visual Inspection .....	1.66
1.13.	Applications of Visual Inspection.....	1.69
	Review and Summary .....	1.72
	Key Terms You Should Remember.....	1.74
	Review Questions .....	1.75

---

### **UNIT - 2 : LIQUID PENETRANT & MAGNETIC PARTICLE TESTING ..... 2.1-2.83**

2.1.	Introduction .....	2.1
2.2.	Principle of Liquid Penetrant Testing.....	2.2
2.3.	Liquid Penetrant Test Process (Test Procedure of Liquid Penetrant Testing).....	2.4
2.4.	Penetrant Materials .....	2.19
2.5.	Penetrants .....	2.19

2.6. Developers.....	2.26
2.7. Equipment for Liquid Penetrant Testing .....	2.31
2.8. Penetrant Testing Methods .....	2.33
2.9. Applications of Liquid Penetrant Testing.....	2.41
2.10. Introduction to Magnetic Particle Testing .....	2.43
2.11. Principle of Magnetic Particle Testing .....	2.44
2.12. Magnetic Particle Testing Process (Procedure of Magnetic Particle Testing).....	2.46
2.13. Dry and Wet particle inspection techniques .....	2.49
2.14. Overview of Magnetism .....	2.53
2.15. Magnetic Field Orientation in Magnetic Particle Testing.	2.56
2.16. Equipment used in Magnetic Particle Testing .....	2.58
2.17. Equipment used in Determination of Magnetic Field Strength and Direction.....	2.65
2.18. Magnetic Particles .....	2.69
2.19. Demagnetization .....	2.71
2.20. Applications of Magnetic Particle Inspection.....	2.72
Review and Summary.....	2.69
Key Terms You Should Remember.....	2.79
Review Questions .....	2.80

---

**UNIT - 3 : THERMOGRAPHY AND EDDY  
CURRENT TESTING.....**

---

**3.1-3.92**

3.1. Introduction.....	3.1
3.2. Basics of Infrared Theory .....	3.2
3.3. Basic Principle of Thermography Testing .....	3.6
3.4. Elements of Infrared Detection Stesting.....	3.12
3.6. Thermography Testing – Passive Approach .....	3.15
3.7. Thermography Testing – Active approach .....	3.16

3.8. Active Thermography Techniques (Types of Active Thermography Testing) .....	3.18
3.9. Pulsed Thermography (Flash thermography) .....	3.20
3.10. Lock-in Thermography (LT).....	3.25
3.11. Vibro Thermography Testing .....	3.28
3.12. Laws of Thermal Imaging in Thermography Testing.....	3.32
3.13. Image Processing in Thermography Non-Destructive Testing .....	3.34
3.14. Non-Contact Dynamic Thermography Inspection Technique .....	3.35
3.15. Applications of Thermography Testing .....	3.37
3.16. Introduction to Eddy Current Testing .....	3.38
3.17. Basics of Eddy Current Testing .....	3.39
3.18. Working Principle of Eddy Current Testing.....	3.42
3.19. Eddy Current Testing Instrumentation.....	3.46
3.20. Factors Influencing Eddy Current Testing (Parameters of Eddy Current Testing) .....	3.49
3.21. Eddy Current Testing Probes.....	3.52
3.22. Magnetic Sensors in Eddy Current Testing .....	3.60
3.23. Selection of Eddy Current Testing Probes/Magnetic Sensors.....	3.64
3.24. Display or Read out Instrument in Eddy Current System .....	3.68
3.25. Evaluation and Iterpretation.....	3.72
3.26. Remote Field Eddy Current Testing .....	3.77
3.27. Applications of Eddy Current Testing .....	3.79
Review and Summary .....	3.86
Key Terms You Should Remember.....	3.88
Review Questions .....	3.89

---

**UNIT - 4 : ULTRASONIC TESTING & ACOUSTIC  
EMISSION TESTING ..... 4.1-4.76**

---

4.1.	Introduction .....	4.1
4.2.	Basics of Ultrasonic Waves.....	4.1
4.3.	Terminologies used in Ultrasonic Testing.....	4.4
4.4.	Basic Principle of Ultrasonic Testing .....	4.11
4.5.	Ultrasonic Testing Methods.....	4.13
4.6.	Equipment for Ultrasonic Testing .....	4.17
4.7.	Ultrasonic Transducers .....	4.20
4.8.	Ultrasonic Inspection Techniques .....	4.33
4.9.	Data Presentation in Ultrasonic Testing (Mode of Displays).....	4.41
4.10.	Variables influencing Ultrasonic Testing .....	4.45
4.11.	Applications of Ultrasonic testing .....	4.48
4.12.	Introduktion to Acoustic Emission Test.....	4.57
4.13.	Basic Principle of Acoustic Emission Test.....	4.57
4.14.	Factors influencing Acoustic Wave Propagation and Data Acquisition.....	4.60
4.15.	Instrumentation of Acoustic Emission Testing .....	4.62
4.16.	Modes of Acoustic Emission Testing .....	4.64
4.17.	Four Channel Data Acquisition in Acoustic Emission Testing .....	4.66
4.18.	Applications of Acoustic Emission Test.....	4.68
	Review and Summary .....	4.69
	Key Terms You Should Remember .....	4.72
	Review Questions .....	4.73

---

<b>UNIT – 5 : RADIOGRAPHY TESTING .....</b>	<b>5.1-5.67</b>
5.1. Introduction .....	5.1
5.2. Principle of Radiography Testing.....	5.3
5.3. Equipment of Radiography Testing.....	5.6
5.4. Advantages, Limitations and Applications of <i>X-ray</i> Radiography Testing.....	5.9
5.5. Gamma ray Radiographic Testing .....	5.10
5.6. <i>X-Ray</i> Film .....	5.15
5.7. Characteristic Curve of X-ray Films.....	5.20
5.8. Development of X-Ray Films.....	5.24
5.9. Interaction of X-Rays with Matter.....	5.27
5.10. Production of X-Rays .....	5.31
5.11. Intensity of X-Rays in Radiography Testing.....	5.33
5.12. Image Quality in Radiography Testing.....	5.35
5.13. Radiography Techniques .....	5.47
5.14. Fluoroscopy (Radioscopy) Testing .....	5.51
5.15. Xerography (Xero radiography) .....	5.54
5.16. Computed Radiography .....	5.56
5.17. Computed Tomography in Non-Destructive Testing .....	5.60
Review and Summary .....	5.62
Key Terms You Should Remember.....	5.65
Review Questions .....	5.65
<b>Two Marks Questions and Answers.....</b>	<b>T.1 – T.30</b>
<b>Model University Question Paper.....</b>	<b>MQ.1 – MQ.3</b>
<b>References .....</b>	<b>R.1 – R.2</b>
<b>Index .....</b>	<b>I.1 – I.5</b>