Register Number:……..

KUMARAGURU
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B.E DEGREE EXAMINATIONS: APRIL 2018

(Regulation 2014)

Eighth Semester

AERONAUTICAL ENGINEERING

U14AEE816**:** Non-destructive Testing for Aerospace Applications

COURSE OUTCOMES

CO1: Evaluate the various methods of Non-destructive testing (NDT) to test the material integrity used in engineering application.

CO2: Apply radiography NDT methods for aerospace applications.

CO3: Apply ultrasonic NDT methods for aerospace applications.

CO4: Apply different NDT processes in aerospace industry.

CO5: Use Thermal inspection, Optical holography NDT methods for aerospace applications.

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Matching type item with multiple choice code CO4 [K_2]

List I	List II
A. Radiography	i. Current carrying coil
B. Magnetic Particle Inspection	ii. Aerosol spray
C. Dye Penetrant Testing	iii.Gamma rays
D. Ultrasonic Flaw Detection	iv.Piezo electric crystal

	A	B	C	D
a)	ii	i	iii	iv
b)	iii	iv	ii	i
c)	iii	i	ii	iv
d)	iii	iv	ii	i

2. Outer diameter of any part can be inspected by which of the following probe CO1 [K_2]

a) Bobbin probe b) Encircling probe

c) Surface probe d) Bolt hole probe

3. The main applications of the eddy current technique are CO2 [K_1]

(i) The detection of surface

(ii) Conductivity measurement

(iii)Coating thickness measurement.

(iv)Upper Surface Flaws

a) 1,3 b) 1,4

c) 1,2&3 d) 2,3

4. The depth of penetration of eddy current in a material depends on CO2 [K_1]

a) Frequency b) Electrical properties of the material

c) Magnetic properties of the material d) All of the above

5. Assertion (A): In radiography the differences in absorption of radiation are recorded on film. CO2 [K_3]

Reason (R):The more the absorption, the more the flaw in the material.

a) Both A and R are Individually true and R is the correct explanation of A b) Both A and R are Individually true but R is not the correct explanation of A

c) A is true but R is false d) A is false but R is true

6. The shape of the ultrasonic beam entering the material depends upon CO3 [K_2]

a) Property of the piezoelectric material b) Diameter of the transducer

c) Voltage used to excite transducer d) Both a and b

7. Order the following steps in optical holography process. CO5 [K_1]

1. When visible light waves are employed in holography, the hologram is recorded using an optical system called a holocamera.
2. A monochromatic laser beam of phase coherent light is divided into two beams by a variable beam splitter
3. One beam, the object beam, is expanded by a spatial filter into a divergent beam directed to illuminate the object uniformly.
4. A portion of the laser light reflected from the object is intercepted by a high resolution photographic plate.

a) 2-3-4-1 b) 1-3-2-4

c) 3-4-2-1 d) 1-2-3-4

8. The ability to locate a small discontinuity is called CO3 [K_2]

a) Sensitivity b) Resolution

c) Wavelength d) Frequency

9. Assertion (A): The advantage of using a step function voltage is that such a voltage contains a range of frequencies CO3 [K_3]

Reason (R): The electromagnetic response to several different frequencies can be measured with just a single step.

a) A is false but R is true
b) Both A and R are Individually true but R is not the correct explanation of A
c) A is true but R is false
d) Both A and R are Individually true and R is the correct explanation of A

10. An internal rupture caused by working steel at improper temperatures is called a CO5 [K_1]

a) Lap
b) Cold Shut
c) Forging Burst
d) Slag inclusion

PART B (10 x 2 = 20 Marks)

(Answer not more than 40 words)

11. What is Non-Destructive Testing (NDT)? CO1 [K_2]
12. List out the needs of using Non Destructive Evaluation methods. CO1 [K_2]
13. Define radiation with some examples. CO2 [K_1]
14. List the imaging methods available in X-Ray Radiography. CO2 [K_1]
15. What is meant by ultrasonic sound wave? CO3 [K_1]
16. Define the terms wave length and frequency in sound wave. CO5 [K_2]
17. Define the term dwell time in liquid penetrant technique. CO4 [K_2]
18. List out any two properties of magnetic line of force. CO4 [K_2]
19. What are the applicatios of acoustic emission technique? CO5 [K_2]
20. Define holography. CO4 [K_1]

Answer any FIVE Questions:-

PART C (5 x 14 = 70 Marks)

(Answer not more than 300 words)

Q.No. 21 is Compulsory

21. With neat sketch explain the step by step process involved in liquid penetrant inspection. CO4 [K_2]

22.	Explain the available NDT methods, applications and advantages of NDT methods on various fields.	CO1	[K_3]
23.	With neat sketch explain the process involved in magnetic particle inspection to determine the location of crack in a ferromagnetic material.	CO4	[K_2]
24.	Explain the process involved in ultrasound generation, ultrasonic test techniques on both Pulse Echo and Through Transmission.	CO3	[K_2]
25.	With neat sketch explain the process of crack detection in an aircraft wing surface using gamma radiography.	CO2	[K_2]
26.	With neat sketch explain the working principle of thermal inspection used for NDT.	CO5	[K_2]
27.	With neat sketch explain the working principle of acoustic emission inspection used for NDT.	CO5	[K_2]

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