



INSTITUTE OF AERONAUTICAL ENGINEERING (Autonomous)

Dundigal -500043, Hyderabad

AERONAUTICAL ENGINEERING

TUTORIAL QUESTION BANK

Course Title	AEROSPACE STRUCTURAL HEALTH MONITORING SYSTEMS				
Course Code	AAE807				
Programme	B.Tech				
Semester	VII	AE			
Course Type	SKILL				
Regulation	IARE - R16				
Course Structure	Theory			Practical	
	Lectures	Tutorials	Credits	Laboratory	Credits
	-	-	-	-	-
Chief Coordinator	Dr. Sudhir Sastry .Y.B, Professor, AE				
Course Faculty	Dr. Sudhir Sastry .Y.B, Professor, AE				

UNIT – I

PART A

1. What is Loads monitoring in structural monitoring Systems?
2. What is Flight parameters-based loads monitoring?
3. What is Strain gauge based loads monitoring?
4. What are the Load models in structural monitoring Systems?
5. What are the Disadvantages of current loads monitoring systems?
6. What is Non-destructive testing in structural monitoring Systems?
7. What is Visual inspection in structural monitoring Systems?
8. What is Ultrasonic inspection in structural monitoring Systems?
9. What is Acoustic emission in structural monitoring Systems?

PART B

1. Explain about Structural damage after MAFT for TORNADO aircraft: with the help of Pie diagram of (a) types of structural damage;(b) types of fatigue cracks
2. Explain about Structural damage after in-service inspection for civil aircraft with the help of Pie diagram
3. Explain Corrosion categories in ageing airframes based on Time dependent, Time related and Time independent which is published in the corrosion of ageing aircraft and its consequences.
4. Explain about Probability of fracture with the help of schematic diagram of the PROF code developed within ASIP.
5. Explain about Widespread fatigue damage (WFD) areas identified for AIRBUS A-300 aircraft with the help of neat sketch.
6. Explain about Ageing Aircraft Problem with the help of ageing civil aircraft overview.
7. Explain about Background of Lifecycle Cost of Aerospace Structures
8. Present a case study of pragmatic analysis of estimation of cost of a new damage inspection/monitoring procedure for a limited period of about ten years of time.
9. Explain the background of Aircraft Structural Design

10. Explain the Damage Monitoring Systems in Aircraft like Loads Monitoring, Flight Parameters-Based Loads Monitoring and Strain Gauge Based Loads Monitoring.
11. What are the Disadvantages of Current Loads Monitoring Systems.
12. Explain about Damage Monitoring and Inspection of Damage Monitoring Systems in Aircraft.
13. Explain about Non-Destructive Testing Visual Inspection and Ultrasonic Inspection.
14. Explain about Non-Destructive Testing Eddy Current Acoustic Emission.
15. Explain about Thermography and Shearography Radiography.
16. Explain about Emerging Monitoring Techniques and Sensor Technologies.

UNIT – II

PART A

1. What are the Optical fibre sensors in structural monitoring Systems?
2. What are the Fibre Bragg grating sensors in structural monitoring Systems?
3. What is Fibre strength degradation in structural monitoring Systems?
4. What is Grating decay in structural monitoring Systems?
5. What is Fibre coating technology in structural monitoring Systems?
6. What is Solvent evaporation – drying in structural monitoring Systems?
7. What is Closure of the majority of rings – curing in structural monitoring Systems?
8. What is Finalization of ring closure – post bake in structural monitoring Systems?
9. What is Chemical bonding in structural monitoring Systems?
10. What is Acid–base interaction in structural monitoring Systems?
11. What is Diffusion in structural monitoring Systems?
12. What is Mechanical interlocking in structural monitoring Systems?

PART B

1. What is optical fibres, explain about optical fibre sensors in structural health monitoring.
2. What is fibre Bragg grating sensors explain with the help of schematic diagram of optical fibre grating process diagram.

3. What is fibrebragg grating sensors explain with the help of sensing concept of a single fbg sensor diagram.
4. Explain about sensor target specifications operational load monitoring.
5. Explain about fibre strength degradation of reliability of fibrebragg grating sensors.
6. Explain about grating decay of reliability of fibrebragg grating sensors.
7. Explain about polyimide chemistry and processing of fibre coating technology.
8. Explain about polyimide adhesion to silica of fibre coating technology.
9. Explain about silane adhesion promoters of fibre coating technology.
10. Brief discussion about experimental example of fibre coating technology.
11. Explain the one of the examples of surface mounted olm sensor system.
12. Explain about sensors of surface mounted olm sensor system with neat sketches.
13. Explain about backing patch and optical fibrebragg gratings.
14. Explain about strain-isolated temperature reference sensor and optical fibre bending radius.
15. Explain about angle of orientation of bragg grating sensors and encapsulation of optical fibre.

UNIT – III

PART A

1. What is Transducersin structural monitoring Systems?
2. What is Ultrasonic testing procedures are based on two major inspection modes
3. Draw the Schematic diagram of a typical transducer used for ultrasonic testing
4. What are the four different types of scans are used in practicein structural monitoring Systems?
5. What is Piezoelectricity and Piezoelectric Materialsand its applications?

PART B

1. Explain how the Transducers are working for detection of damage of aircraft structures with the help of neat sketches.
2. Explain how the Signal Processing is used for detection of damage of aircraft structures with the help of neat sketches.
3. Explain what the three major steps are for Testing and Calibration of AE equipment to be calibrated
4. Explain about Transducers with the help of Schematic diagram of a typical transducer used for ultrasonic testing
5. Explain about Display Modes with the help of Ultrasonic C-scan examples from a composite plate
6. What is Acousto-Ultrasonics explain with the help of Acousto-ultrasonic stress waves from damage detection in a composite-metal joint diagram.
7. Define various types of guided waves which are the most widely used guided waves for structural damage detection.
8. Explain Lamb waves refer to elastic perturbations propagating in a solid plate with free boundaries for which the displacements correspond to different basic propagation modes.
9. Explain Lamb wave dispersion characteristics for an aluminium plate and Snapshots of the S₀ Lamb wave mode propagation in an aluminium plate with a damage slot after:
10. What is Piezoelectricity and Piezoelectric Materials explain with the help of neat sketches
11. Derive and explain about Constitutive Equations in Damage Detection Using Stress and Ultrasonic Waves
12. How the Impact Damage Detection in Composite Materials will be conducted explain with the help of neat sketches
13. Explain how the Crack Monitoring in Metallic Structures Using Broadband Acousto – Ultrasonics
14. How the Impact Damage Detection will be conducted in Composite Structures Using Lamb Waves
15. Explain about Impact Damage Detection Structural Health Monitoring.

UNIT – IV

1. Explain about feature selection in signal features for damage identification
2. Explain about time–domain analysis in signal features for damage identification
3. Explain about spectral analysis in signal features for damage identification
4. Explain about instantaneous phase and frequency in signal features for damage identification
5. Explain about time–frequency analysis in signal features for damage identification
6. Explain about continuous wavelet transform in wavelet analysis
7. Explain about discrete wavelet transform in wavelet analysis
8. Explain about principal component analysis dimensionality reduction using linear and nonlinear transformation
9. Explain about sammon mapping dimensionality reduction using linear and nonlinear transformation
10. Explain about data compression using wavelets
11. Explain wavelet-based de noising with the help of reconstructed lamb wave responses figures
12. Explain about pattern recognition for damage identification
13. Explain about parallel processing paradigm of artificial neural networks
14. Explain about the artificial neuron in artificial neural networks
15. Explain about multi-layer networks in artificial neural networks

UNIT - V

1. Discuss about lamb wave results from aluminum multi-rivet butt strapped metallic panel Specimens.
2. Discuss about acoustic emission results from a full-scale fatigue test.
3. Explain about the large-scale composite evaluator.

4. Explain about the sensor and specimen integration.
5. Explain about the impact tests of structural health monitoring evaluation tests.
6. Discuss about the damage detection results of distributed optical fibre sensors.
7. Draw and explain the block diagram of the distributed damage sensor.
8. Discuss about the damage detection results of bragg grating sensors.
9. Explain about the lamb wave damage detection system.
10. Explain about the acoustic emission optical damage detection system.
11. Explain about the bragg grating optical load measurement system.
12. Explain about the fibre optic load measurement rosette system.
14. Explain with the help of graph the data captured during flight test -60° banked turns anticlockwise and clockwise orbits: (a) acceleration; (b) strain from optical fibre sensors.
15. Explain with the help of graph the data captured during flight test – strain angle from opticalfibre sensors.