[Total No. of Questions: 08]

EVENING

[Total No. of Pages: 2]

Uni. Roll No. ....

16 MAY 2024

Program: M.Tech. (Batch 2019 onward)
Name of Subject: Structural Health Monitoring &
Retrofitting
Subject Code: MST-115
Paper ID: 17750
Scientific calculator is NotAllowed

Time Allowed: 03 Hours

Max. Marks: 100

NOTE:
1) Attempt all questions
2) Any missing data may be assumed appropriately

Part-A (4 @ 5 = Marks)

Q1. Define structural health and explain how factors affecting the health of structures can be identified.

Q2. Describe the hardware requirements for remote data acquisition systems used in structural health monitoring.

Q3. Differentiate between static field testing and dynamic field testing in the context of structural health monitoring.

Q4. Discuss the various types of static tests used in structural health monitoring. Provide examples of each.

Part-B (4 @ 20 = 80 Marks)

Q5. Explain the significance of static response measurement in structural health monitoring. How is it conducted and what insights can be gained?

Or

Compare and contrast different types of dynamic field tests used in structural health monitoring. Discuss their advantages and limitations.

Q6. Describe the principles behind ultrasonic testing (UT) as a non-destructive testing technique. Discuss how UT is used to detect flaws, measure material thickness, and assess the integrity of welds in structural components. Provide a step-by-step explanation of the UT process and highlight its advantages and limitations.

Or

Examine the importance of crack monitoring techniques in assessing the severity and progression of cracks in structures over time. Discuss the advantages and limitations of different crack monitoring methods, including visual inspection, crack gauges, and digital imaging technologies.

Q7. Explore the applications of piezoelectric materials and other smart materials in modern structural health monitoring techniques. How do they enhance monitoring capabilities?

Or

Describe the electromechanical impedance (EMI) technique in structural health monitoring. Discuss its adaptations and how it is applied in practice.

Q8. You are a structural engineer tasked with conducting a structural audit of an old bridge that has been in operation for over 50 years. During your initial inspection, you observe signs of distress such as cracks, corrosion, and deformation. The bridge is vital for connecting two towns and is heavily used by both vehicular and pedestrian traffic.

Outline the steps you would take to assess the health of the bridge comprehensively. Discuss the factors you would consider in determining the severity of the observed distress and propose immediate measures to ensure the safety of users while a detailed audit is conducted.

Or

You are part of a team responsible for implementing a structural health monitoring system for a newly constructed skyscraper in a seismic zone. The building is expected to accommodate office spaces, residential units, and commercial facilities.

Describe the key considerations you would take into account when designing and installing the structural health monitoring system for the skyscraper. Discuss the specific challenges posed by the seismic environment and propose strategies to address them effectively.

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