



M.E DEGREE EXAMINATIONS: DEC 2022

(Regulation 2018)

Third Semester

STRUCTURAL ENGINEERING

P18SEE0005: Structural Health Monitoring

COURSE OUTCOMES

CO1: Diagnose for serviceability and durability aspects of concrete.

CO2: Suggest the materials and techniques used for repair of structures.

CO3: Decide the appropriate repair, strengthening, rehabilitation and retrofitting technique required for a case study building

CO4: Recommend an appropriate health monitoring technique and demolition technique

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Which of the following variables has zero value at the extreme position in SHM? CO1 [K₂]
 - a) Acceleration
 - b) Displacement
 - c) Speed
 - d) Angular frequency
2. The pH value of fresh concrete is around CO1 [K₁]
 - a) 12.5
 - b) 8
 - c) 13
 - d) 9.5
3. If the cracks width is less than 0.1 mm then they are called CO2 [K₂]
 - a) fine
 - b) medium
 - c) wide
 - d) thin
4. In India, many long span bridges have been constructed using _____ CO2 [K₁]
 - a) Suspended Cables
 - b) Simply Supported
 - c) Cantilever
 - d) Fixed on both sides
5. The piezoelectric materials used for converting energy are called as _____. CO3 [K₂]
 - a) Transducer
 - b) Actuators
 - c) Dielectric
 - d) converters

6. The approaches made for inspection & cleaning of sewers is called CO2 [K₂]
 a) Cover b) Manhole
 c) Trap d) Drain
7. Assertion (A): Fluoride glass is used with IR waves. CO4 [K₂]
 Reason (R): General spectral range for silica glass is between 200 nm to 220 nm
 a) Both A and R is false. b) A is false. But R is True.
 c) A is true. But R is false. d) Both A and R is True.
8. Which of the following error is caused by a reversal of measured property? CO4 [K₁]
 a) Noise b) Quantization error
 c) Digitization error d) Hysteresis
9. Bonding element in a strain gauge must have CO4 [K₂]
 a) Zero insulation resistance b) Low insulation resistance
 c) High insulation resistance d) Infinite insulation resistance
10. MARG sensor is abbreviated as CO3 [K₂]
 a) Magnetic Angular Rate and Gravity b) Magnitude Angular Rate and Gravity
 c) Magnetic Angular Resistance and Gravity d) Magnetic Angular Resistance and Ground

PART B (10 x 2 = 20 Marks)

11. Differentiate between Non-Destructive Evaluation (NDE) and Structural Health Monitoring. CO1 [K₂]
12. What are the objectives of monitoring the health of a structure? CO1 [K₂]
13. What is deterioration in a structure? CO1 [K₂]
14. Define Local and global methods in SHM CO2 [K₂]
15. What are the sensors in structural health monitoring? CO2 [K₂]
16. What are piezo– electric materials. CO3 [K₂]
17. How are bridge Decks repaired using sensors. CO3 [K₂]
18. Write short notes on member replacement. CO4 [K₂]
19. What are the smart materials used in structural engineering? CO4 [K₂]
20. Explain Scope of Structural Health Monitoring? CO1 [K₂]

PART C (6 x 5 = 30 Marks)

21. What are the various steps involved in structural health monitoring? Explain them in detail. 5 CO1 [K₂]
22. Explain the Principle and Organization of a Structural Health Monitoring System? 5 CO1 [K₂]
23. Define and explain in detail about electro–mechanical impedance (EMI) technique. 5 CO3 [K₂]
24. Discuss how piezo– electric materials are used in structural health monitoring. 5 CO3 [K₂]
25. Explain the various model-based techniques in dynamic structural health monitoring. 5 CO4 [K₂]
26. Explain the Role of optical Fiber Sensors in Structural Health Monitoring System? 5 CO2 [K₂]

Answer any FOUR Questions

PART D (4 x 10 = 40 Marks)

27. Explain the Challenges in implementation of Structural Health Monitoring System? 10 CO1 [K₂]
28. Discuss about Effective Structural Health Monitoring System Methodology? 10 CO1 [K₂]
29. Explain the role of different types of sensors in health monitoring of structures? 10 CO2 [K₂]
30. List out the applications of structural health monitoring in post-earthquake controls. 10 CO3 [K₂]
31. Explain the Applications of Structural Health Monitoring in Bridge Structures? 10 CO4 [K₂]
