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Question Paper Code : 82309

M.E. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2013.

Second Semester

Structural Engineering

ST 9222/ST 922/UST 9122/10211 SE 202 — EXPERIMENTAL TECHNIQUES AND INSTRUMENTATION

(Regulation 2009/2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between Load cell and proving ring.

2. Draw Wheatstone bridge circuit to compensate the temperature effects while measuring bending stress in beam specimen.

3. Define the term simple harmonic motion.

4. What is the use of XY plotter and how does it differ from conventional printer?

5. What is the importance of wind tunnel study?

6. Define the term Model and when do you resort to model analysis.

7. Distinguish between dry and wet corrosions.

8. What is implosion and its use?

9. Which NDT methods used to assess the surface and core strengths of a concrete?

10. Define the term Holography and it use.

PART B — (5 × 16 = 80 marks)

11. (a) (i) How will you capture dynamic strains? (3)

(ii) How will you measure pure torque experimentally. (3)

(iii) The following observations are made in four element rectangular rosette mounted on a steel specimen having E=207GPa and $\mu = 0.3$. Check whether the four values are compatible (10)

Case No	$\in_A (\mu m/m)$	$\in_B (\mu m/m)$	$\in_C (\mu m/m)$	$\in_D (\mu m/m)$
1	1000	-500	0	500
2	1800	600	-400	800
3	-1000	400	400	-1000
4	1600	-200	-1800	0
5	-400	0	400	0

Or

(b) (i) Show that how a single element strain gauge can be employed to determine the principal stresses for a circular shaft having a state of pure shear. (5)

(ii) For a simple span beam with two points at equal distance, mention the strain gauge arrangements to measure bending strains, shear strains and rotations. (5)

(iii) Explain how photo-elastic technique helps in the structural analysis. (6)

12. (a) (i) Explain briefly how Linear Variable Differential Transformer (LVDT) works. (10)

(ii) Discuss which signal (displacement, velocity and acceleration) is the most sensitive to capture the vibration of cantilever beam subjected to harmonic loading. (6)

Or

(b) (i) Explain the use of digital data acquisition systems. (4)

(ii) Explain the working principle of digital type Oscilloscope and mention their applicability. (8)

(iii) Explain the basic principle behind seismographs. (4)

13. (a) (i) Draw the strain gauge arrangement in a pressure transducer to measure the laminar flow. (4)

(ii) Draw a neat sketch showing the different components parts wind tunnel (5)

(iii) Explain briefly the working principle of a wind tunnel (7)

Or

(b) Discuss the following :

(i) Importance of transducers in flow measurements (5)

(ii) Use of sound level and venture meters (6)

(iii) Direct Model analysis. (5)

14. (a) Discuss the following :

(i) Carbonation and its effects in concrete structures (6)

(ii) Explain the term Catholic protection and it importance (5)

(iii) Techniques used to measure residual stresses. (5)

Or

(b) (i) Explain how to diagnosis a dilapidated structure (6)

(ii) Explain how to demolish a column damaged due to corrosion (5)

(iii) Factors which influence the corrosion of steel in concrete. (5)

15. (a) (i) Explain the use of NDT testing techniques (6)

(ii) Explain how Holography is useful in structural applications purpose (5)

(iii) Use of ground penetrating radar. (5)

Or

(b) (i) Explain the basic concept behind the testing of towers and mention any two places in Tamilnadu where tower testing is carried out. (6)

(ii) Why are Engineered demolition for high rise dilapidated buildings not popular in India (4)

(iii) What are the uses of ultrasonic pulse velocity and Rebound Hammer tests? (6)

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