

## DEPARTMENT OF CIVIL ENGINEERING



### **MAJOR :CEL836 STRUCTURAL HEALTH MONITORING** **(2014-15)**

**Time allowed:** 2 hours  
**Venue** : VI 401

**Date** : 06 May 2014  
**Max marks** : 30

**NOTE:** (a) This question paper contains one page only. (b) All questions are compulsory. (c) **Assume any data which you deem is necessary but not supplied.** (d) Draw neat and clear sketches wherever required.

#### **Question 1.**

- State the observations related to stiffness loss as a function of loading cycles during fatigue related experiments involving bolted joint specimens monitored by EMI technique.
- On what basis can the PZT identified stiffness substitute the absolute stiffness of the specimen.
- What is the practical relevance of the correlation between the PZT identified stiffness and the absolute stiffness?

**(2+2+2 = 6 marks)**

#### **Question 2.**

Explain how we can reduce the interrogation time for an array of PZT patches instrumented on say a 2D structure for routine monitoring when localization is not of utmost importance? Further, how do we localize damage in case existence of damage is established?

**(3 marks)**

#### **Question 3.**

An electrical strain gauge of base resistance 350 ohms is installed in a structural component. What should be the resolution of the interrogation system be if it is desired to measure strain with a resolution of 0.5 microstrain? The gauge factor for the strain gauge as supplied by the manufacturer is 2.16.

**(5 marks)**

#### **Question 4.**

Describe the principles, two advantages and two limitations of **magnetic particle inspection** and **dye reentrant testing** techniques.

**(3+3 = 6 marks)**

#### **Question 5.**

Describe the principle and equipment arrangement for the low-cost adaptation of the EMI technique employing the PZT patch in self-sensing mode. State its two advantages and two limitations as compared to the LCR approach.

**(3+3 = 6 marks)**

#### **Question 6.**

Describe the uniform load surface curvature method for damage assessment.

**(4 marks)**