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BIMEE-005

B.Tech. – VIEP – MECHANICAL ENGINEERING (BTMEVI)

Term-End Examination

00953

June, 2018

BIMEE-005 : EXPERIMENTAL STRESS ANALYSIS

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. All questions carry equal marks. Assume any missing data suitably. Use of scientific calculator is permitted.*

1. (a) Explain with a neat sketch, the working of a single pressure output pneumatic strain gauge. 7

(b) Define gauge factor and derive an expression for gauge factor. 7

2. (a) Using Wheatstone bridge with load resistance, explain the error due to input impedance of the measuring instrument. 7

(b) Explain absolute and relative phase difference of polarized light. 7

3. (a) Explain with a neat sketch, the principle of operation of a plane polariscope. 7

(b) List the properties of photoelastic material and also give a list of materials used. 7

4. (a) Describe with a neat sketch, the phenomenon of scattered light photoelasticity. 7

(b) Explain the brittle coating method in detail. What are the advantages and limitations of this method ? 7

5. (a) Explain the method of calibration of a photoelastic model material using a beam under pure bending. 7

(b) Explain the method of out-of-plane displacement using Moire fringe technique. 7

6. A three-element strain rosette is bonded on to the surface of a specimen for strain measurement. Strain gauge 'A' is along X-axis and strain gauges 'B' and 'C' are oriented along the specimen. When loaded, the strain gauge yields the following strains :

$\varepsilon_0 = + 500\ \mu m/m,$

$\varepsilon_{120} = - 250\ \mu m/m$ and

$\varepsilon_{240} = 250\ \mu m/m.$

Given $k_t = - 0{\cdot}07$

$v_0 = 0{\cdot}285$

Determine the magnitude and directions of principal strains at the point where the strain rosette is bonded. 14

7. (a) Draw the schematic diagram of holographic set-up and explain recording and reconstruction process of images in 'holography'. 7

(b) What is birefringent coating ? Explain the reinforcing effect of birefringent coating. 7

8. Write short notes on any ***four*** of the following : $4 \times 3\frac{1}{2} = 14$

(a) Quarter-Wave and Half-Wave Plates

(b) Pneumatic Strain Gauge

(c) Isochromatics and Isoclinics

(d) Mismatch Technique

(e) Photoelastic Casting

(f) Tardy Compensation