



CBCS SCHEME

18CAE321

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Third Semester M.Tech. Degree Examination, Jan./Feb.2021 Experimental Mechanics

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Explain in brief the following terms:
 - (i) Sensitivity of an instrument.
 - (ii) Accuracy and precision.
 - (iii) Calibration.
 - (iv) Distortion. (08 Marks)
- b. With a schematic diagram, explain generalized measurement system. (08 Marks)
- c. What is impedance matching? Explain. (04 Marks)

OR

- 2 a. Explain in brief statistical analysis of experimental data. (10 Marks)
- b. Explain the following :
 - (i) Probability distribution.
 - (ii) Chi-square test. (10 Marks)

Module-2

- 3 a. What are the types of A/D converters? With a neat sketch explain successive approximation converter. (08 Marks)
- b. Explain with a neat sketch mass balance measurement. (08 Marks)
- c. What is mean by strain gauge rosettes? List the commonly used configurations of strain gauge rosette. (04 Marks)

OR

- 4 a. Explain the environmental factors which effects the performance of strain gauge. (08 Marks)
- b. A rectangular strain gauge rosette is bonded at a critical point onto the surface of a structural member. When the structural member is loaded, the strain gauge shows the following readings:
 $\epsilon_0 = 850 \mu\text{m/m}$, $\epsilon_{45} = -50 \mu\text{m/m}$ and $\epsilon_{90} = -850 \mu\text{m/m}$.
The gauge factor and cross sensitivity of the gauges are 2.80 and 0.06 respectively.
Find : (i) Actual strains
(ii) Magnitude and directions of corrected principal strains and principal stresses .
Given $E = 200 \text{ GPa}$ and $\nu_0 = 0.285$ (12 Marks)

Module-3

- 5 a. Explain the importance of passage of light through crystalline medium. (08 Marks)
- b. State and explain stress-optic law for 2-D photoelasticity. Derive the corresponding stress optic relation equations. (12 Marks)

OR

- 6 a. Explain the significance of isochromatics and isoclinics in photoelasticity and explain the formation of these fringes in plane polariscope. (12 Marks)
- b. Explain the experimental procedure to calibrate circular disc under diametral compression. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

Module-4

- 7 a. Explain stress-freezing technique for 3D-photoelasticity. Give spring Ice analogy to explain this concept. (12 Marks)
b. Explain briefly shear difference method of separation of stresses in case of 3D-photoelasticity. (08 Marks)

OR

- 8 a. Explain in brief slicing and interpretation of resulting fringe pattern in 3D-photoelasticity. (10 Marks)
b. With neat sketch explain the working of scattered light polariscope. (10 Marks)

Module-5

- 9 a. Explain theory of brief ringent coating. Obtain the relation between principal stresses in coating to the principal stresses on surface of machine part. (10 Marks)
b. Explain the following types of Brittle coating materials:
(i) Resin based coating-stress coat. (10 Marks)
(ii) Ceramic based coating – All Temp. (10 Marks)

OR

- 10 a. Explain with neat sketch Moire displacement approach for a Cantilever plate. (08 Marks)
b. Explain with neat sketch of schematic representation of Holographic setup. (06 Marks)
c. Obtain the equation for intensity of spherical wave expressed by the equation $I = UU^*$. (06 Marks)
