

R09

Code No: D7604**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****M.Tech II - Semester Examinations, March/April 2011****AEROSPACE SENSORS AND MEASUREMENT SYSTEMS****(AEROSPACE ENGINEERING)****Time: 3 hours****Max. Marks: 60**

Answer any five questions
All questions carry equal marks

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1. a) Define the terms sensitivity and calibration of an instrument with an example.
b) Give different types of errors occur during measurement with an instrument. Suggest minimizing the same. [6+6]
2. a) Explain neatly with a sketch, the working of a Laser Doppler Anemometer (LDA).
b) Explain with neat sketch, the working of Hot wire Anemometer. [6+6]
3. a) Explain path lines, streak lines, stream lines and time lines in a fluid flow.
b) Explain the different methods used for flow field visualization. [6+6]
4. a) What are the different types of wind tunnels? Explain with neat sketches.
b) Explain with neat sketch the working principle of an internal balance for measuring the lift force. [6+6]
5. a) Explain the working principle of electrical working strain gauge for strain measurement.
b) A rectangular rosette is mounted on a steel plate having $E=200$ GPa and Poisson's ratio=0.3. The three strains are measured as
$$\varepsilon_1 = + 500 \mu \text{ mm/mm}$$

$$\varepsilon_2 = + 400 \mu \text{ mm/mm}$$

$$\varepsilon_3 = - 100 \mu \text{ mm/mm}$$
Calculate the principal strains and stresses, the maximum shear stress, and the orientation angle for the principal axis of the stress. [6+6]
6. a) What are the vibrational measuring instruments and explain the working principle of any one instrument.
b) Why an active band analyzer is used in sound measurement? Explain. [6+6]
7. a) Explain with neat sketch the working principle of pendulous accelerometer (open and closed loop).
b) Explain the construction, principle of working and salient features of Piezo- electric type accelerometer. [6+6]
8. Explain:
 - a) Infrared Earth Sensors.
 - b) Horizon Crossing Sensors.
 - c) Star Sensors. [4+4+4]
