

Code No: D7604

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.TECH II - SEMESTER EXAMINATIONS, APRIL/MAY 2012
AEROSPACE SENSORS AND MEASUREMENT SYSTEMS
(AEROSPACE ENGINEERING)

Time: 3hours**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 that occur during measurement with an instrument. Suggest minimizing these errors.
- 2.a) What is meant by positive displacement flow meter? Explain any one of the positive displacement flow meters with neat sketch.
b) Explain neatly with a sketch, the working of a Doppler Global Velocimetry (DGV).
- 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.
- 4.a) Explain aerodynamic wind tunnels.
b) Describe the three-component Roof balances.
- 5.a) Explain the working principle of electrical 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
$$\begin{aligned}\varepsilon_1 &= + 500 \mu \text{ mm/mm} \\ \varepsilon_2 &= + 400 \mu \text{ mm/mm} \\ \varepsilon_3 &= - 100 \mu \text{ mm/mm}\end{aligned}$$
Calculate the principal strains and stresses, the maximum shear stress, and the orientation angle for the principal axis of the stress.
- 6.a) Describe basic concept of seismic instrument.
b) A cantilever beam of span 3 m of steel of cross sectional area 10 mm x 20 mm is subjected to a free end transverse load of 4 kN, along the depth. Determine the natural frequency of vibration. If the beam used as a simply supported beam loading at center, determine the frequency and vibration.
- 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.
8. Write short notes on
 - a) Rate gyros
 - b) Magnetometers
 - c) Sun sensors.
