**Code No: D7604** **R09**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**
**M.Tech II - Semester Examinations, March/April 2011**
**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 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 pitching moment. [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 Poison's ratio=0.3.The three strains are measured as
      $\varepsilon_1 = + 500\ \mu$ mm/mm
      $\varepsilon_2 = + 400\ \mu$ mm/mm
      $\varepsilon_3 = - 100\ \mu$ 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]

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