Code No: **RT41354** **R13** **Set No. 1**

IV B.Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2018

MECHANICAL MEASUREMENTS AND INSTRUMENTATION

(Agriculture Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any THREE questions from Part-B
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PART–A *(22 Marks)*

1. a) Explain different types of instrumentation systems. [4]
   b) Explain classification of transducers. [4]
   c) What are the disadvantages of Mcleod pressure gauge? [3]
   d) Explain cross sensitivity of a strain gauge. [3]
   e) What are the desirable properties for a liquid used in thermometers? [4]
   f) Explain the principle of working of a thermocouple. [4]

PART–B *(3x16 = 48 Marks)*

2. a) Explain the working of a Bourdon tube pressure gauge with a neat sketch. [8]
   b) A voltmeter with internal resistance of 200 kΩ is connected across an unknown resistance. It reads250 V and the milliammeter connected in series with the same resistance reads 10 mA. Determine the apparent resistance, actual resistance and loading error due to the loading effect of the voltmeter. [8]

3. a) Discuss the signal conditioning elements and their principles of operation. [8]
   b) Explain about primary and secondary transducers. [8]

4. a) A well type manometer uses mercury as the manometric fluid. The displacement of mercury in the well is 25 mm. The area of well is 6500 mm^2. The maximum span of manometer is 25 kN/m^2. Calculate the inside diameter of the manometer tube. The density of mercury is 13.56×10^3 kg/m^3. [8]
   b) Explain the working of Bridgman pressure gauge for measurement of high pressure. [8]

5. a) The resistance of a strain gauge is R_g = 120Ω and its gauge factor is 2. It is connected in a current sensitive Wheatstone bridge in which all the resistances are 120Ω. The input voltage is 4 V. Calculate the detector current in μA for 1 microstrain. The resistance of the galvanometer is 100Ω. Calculate the voltage output if 1 microstrain is applied to the gauge and the voltmeter has infinite input impedance. [8]
   b) Derive an expression for gauge sensitivity of a strain gauge for measurement of strain on account of force acting on a cantilever using four active strain gauges. [8]

6. a) Explain the working of pressure gauge thermometers with a neat sketch [8]
   b) Explain the working of bimetallic thermometers. [8]

7. a) The sound pressure level measured at 10 m from an automobile horn is 110 dB. Determine the sound pressure level at distances of (a) 20 m and (b) 80 m. Assume that the inverse square law holds good between intensity and distance. [8]
   b) Explain the working of stroboscope used for speed measurement. [8]