

**B.Tech Odd Semester (CBCS) Exam.,
December—2018**

AGRICULTURAL ENGINEERING

(5th Semester)

Course No. : AE-EL-01

(Instrumentation and Control)

Full Marks : 50

Pass Marks : 15

Time : 2 hours

- Note :*
1. Answer any **five** questions.
 2. Begin each answer in a new page.
 3. Answer parts of a question at a place.
 4. Assume reasonable data wherever required.
 5. The figures in the margin indicate full marks for the questions.
1. Explain briefly the following terms used in instrumentation and measurement systems : 10
 - (a) Calibration
 - (b) Sensitivity
 - (c) Precision
 - (d) Resolution
 - (e) Hysteresis

2. Explain the principle of working of a resistance strain gauge. Explain the techniques of temperature compensation during mechanical force measurement using strain gauges. 10
3. What is draft? During the measurement of draft of a 3-bottom mouldboard plow, top link was found to be inclined downward to horizontal by 20°. The left and right bottom links were found to be inclined downwards by 35° and 40° from the horizontal. The compressive force on the top link was 1.5 kN. The force along the left lower link was 6.5 kN and that on the right lower link was 7.0 kN. Determine the magnitude and direction of line of pull and draft of the implement. 10
4. Explain the working of hydraulic brake dynamometer. A gasoline engine working on 4-stroke develops a brake power of 24 kW. A Morse test was conducted on this engine and the brake power (kW) obtained when each cylinder was made inoperative by short circuiting the spark plugs are 15.9, 16.3, 16.4 and 16.5 respectively. The test was conducted at constant speed. Find the indicated power, mechanical efficiency and bmep when all the cylinders are firing. The bore of engine is 80 mm and stroke is 90 mm. The engine is running at 3000 r.p.m. 10

5. What is a load cell? A beam type load cell of width 250 mm and thickness 60 mm is to be mounted with four strain gages, which will enable measuring a maximum load of 120 kN. If the strain gages are to be mounted at the root of the cantilever, determine the approximate length of the beam. Use aluminium ($E = 80$ GPa, $\nu = 0.3$, and $\sigma_y = 150$ MPa) as the beam material and four electrical resistance strain gages (gage factor = 2 and gage resistance = 120 Ω) as sensors. Determine (E_o / E_i) and sensitivity for this load cell. 10
6. (a) Illustrate the working principle of LVDT for displacement measurement. 5
(b) Write the fundamental laws of thermocouple. 5
7. Distinguish between thermistor and electrical resistance thermometer. Explain the procedure for the following using thermistors : 10
(a) Temperature control
(b) Liquid level measurement
8. What do you mean by feedback control? Explain various types of feedback control taking the example of temperature control in a hot air oven. 10
