

**B.Tech Odd Semester (CBCS) Exam.,
December—2017**

AGRICULTURAL ENGINEERING

(5th Semester)

Course No. : AE-501 (C)

(Instrumentation and Control)

Full Marks : 75

Pass Marks : 30

Time : 3 hours

- Note :*
1. Attempt **one** question from each Unit.
 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.

UNIT—1

1. (a) Explain the functional elements of an instrument with examples. 10
- (b) Distinguish among least count, sensitivity and resolution. 5

2. (a) Distinguish between the analog and digital type of instrument. 5
- (b) What are the uses of U-tube manometer? Convert the following pressures into kPa absolute pressure, if the atmospheric pressure is 763 mm Hg : 10
 - (i) 1.2 m water gage
 - (ii) 60 cm Hg gage
 - (iii) 500 mm Hg vacuum

UNIT—2

3. (a) What is a strain gage? Write its uses. Explain the working principle of strain gages. 5
- (b) Explain the circuit for the measurement using strain gages. What is temperature compensation? How do you get amplification in a strain gage bridge circuit? Explain. 10
4. (a) What is a load cell? A beam type load cell of width 200 mm and thickness 50 mm is to be mounted with four strain gages, which will enable measuring a maximum load of 100000 N. If the strain gages are to be mounted at the root of the cantilever, determine the approximate length of the

(3)

- beam. Use aluminium
($E = 70$ GPa, $\sigma = 0.33$ and 150 MPa)
as the beam material and four electrical
resistance strain gages (gage factor = 2
and gage resistance = 120Ω) as sensors.
Determine (E_0 / E_i) and sensitivity for
this load cell. 10
- (b) What is LVDT? Explain the methods by
which LVDT can be used for the
measurement of angle and pressure. 5

UNIT—3

5. (a) What is meant by draft of an
implement? Explain the complete
instrumentation system employed for
the measurement of draft of a tractor
drawn tillage implement with only one
tractor. 10
- (b) Explain the method of determination of
draft of implement by 2-tractor method. 5
6. (a) During the measurement of draft of a
3-bottom mouldboard plow, top link
was found to be inclined to horizontal
by 8° . The left and right bottom links
were found to be inclined downwards by
 10° and 12° from the horizontal.

(4)

- The compressive force on the top link
was 2.5 kN. The horizontal and
downward vertical forces on the left-
lower link were 7.5 kN and 1.25 kN,
respectively and that on the right-lower
link were 8.2 kN and 1.1 kN,
respectively. Determine the magnitude
and direction of line of pull and draft of
the implement. 10
- (b) What are the various types of
dynamometers available for the
measurement of force? Explain. 5

UNIT—4

7. (a) What is thermistor? Explain resistance-
temperature, voltage-current and
current-time characteristics of
thermistor. 10
- (b) Explain the procedure for the
measurement of the following using
thermistors : 5
- (i) Temperature control
- (ii) Liquid level measurement

8. (a) What is thermocouple? State the laws of thermocouple along with applications. 10
- (b) What is electrical resistance thermometer? Explain resistance thermometer bridge circuits. 5

UNIT—5

9. (a) 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
- (b) What is cascade control? Explain. Write the advantages of cascade control. 5
10. (a) Explain the working of a microprocessor-based computer. 10
- (b) Explain the working of analog-to-digital converter. An 8-bit ADC has V_{ref} of 7 Vdc. The analog input is 2.5 Vdc. What is the binary output of ADC? 5

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