Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH(ICE)/SEM-6/IC-603/2012

2012

INDUSTRIAL INSTRUMENTATION – II

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

$10 \times 1 = 10$

i) Determination of the massflow rate of a gas using an orifice plate is based on the following measurements
   a) DP across the orifice and Static pressure of the gas
   b) DP across the orifice and absolute temperature of the gas
   c) DP across the orifice, Static pressure of the gas and its absolute temperature
   d) DP across the orifice and viscosity of the gas.

ii) Reynolds number

a) increase with increase in average velocity of liquid

b) decrease with increase in absolute viscosity of liquid

c) increase with increase in density of flowing liquid

d) all of these.

iii) Square root extractor is not required for

a) Venturimeter

b) Electromagnetic flowmeter

c) Rotameter

d) TC.

iv) Which flowmeter that works on the constant pressure drop principle ?

a) Venturimeter b) Rotameter

c) Turbine flowmeter d) Vortex flowmeter.

v) A flow meter whose output is independent of fluid density is

a) Turbine flowmeter

b) Electromagnetic flowmeter

c) Venturimeter

d) Orifice meter.

vi) In case of Pilot tube

a) velocity head is converted into pressure head

b) pressure head is converted into velocity head

c) pressure head is converted into datum head

d) none of these.

vii) Float material of weight flow rate measurement in rotameter is

a) Stainless steel b) Plasmet

c) Glass d) Phosphor bronze.

viii) In radiation level detector, when the tank is full with liquid, the amount of radiation received at the detector is

a) directly proportional to the amount of liquid between the radiation source and the detector

b) inversely proportional to the amount of liquid between the radiation source and the detector

c) independent of the amount of liquid

d) none of these.

ix) The Zener barrier is used in

a) flame proof instrument

b) intrimically safe instrument

c) electromagnetic instrument

d) none of these.

x) In case of capacitance level measurement, capacitance will ..... with the increase of level.

a) increase

b) decrease

c) remain same

d) no relation between level & capacitance

xi) Shielding is used to block

a) electrostatic field b) magnetic fields

c) EMI d) all of these.

xii) IP and NEMA are used for

a) specifying the regulated power supply

b) defining the protection level of the devices

c) designing integrated circuits

d) defining the protection level of enclosures.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following $3 \times 5 = 15$

2. What is Reynolds number ? How does it come in for flow calculation ? How Laminar and turbulent flows are related to Reynold's number ?

3. a) What is working principle of Pitot Tube ? Derive the expression of volumetric flow rate of Pitot Tube.

b) A Pitot Tube with coefficient of 0·95 is used to measure the velocity of air in a pipe. The measure differential pressure is 400 mm. What is the velocity of air in a pipe ? 3 + 2

4. What are the difference tapping positions for fluid flow line in orifice flow meter ? What is Venacontracta position ? Can a tapping be made at that position with varying flowrate ?

5. Explain the working principle of radiation level detector.

6. What do you mean by intrinsic safety ? How is zener barrier used for intrinsic safety ? 1 + 4

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) What is principle of hot-wire anemometer ? Explain the two types of hot-wire anemometer.

   b) Describe with net sketches the working principle of a laser Doppler anemometer (LDA). (3 + 7) + 5

8. a) Explain the working principle of transit time ultrasonic flow meter.

   b) What is Doppler Effect ? How is it used in flow measurement ?

   In an ultrasonic flowmeter, the beat frequency is 805 cps, the angle (0) between the transmitters and receivers is 45°, and the sound path is 120 mm. Calculate the fluid velocity in m/sec. (6 + 6) + 3

9. a) Explain with neat diagrams, the working principle of electromagnetic flowmeter. Write down its advantages.

   b) What are the different direct methods available for liquid level measurement ?

   c) What is the basic differences between float type and displacer type level indicators ? (4 + 2) + 6 + 3

10. a) What is the difference between IP code for the enclosures & NEMA equivalent ?

    b) What is grounding ? What is ground plane ? Find the relationship between the voltages developed in the ground plane and change in the current in the ground plane. How is this voltage reduced ?

    4 + (2 + 2 + 2 + 2 + 3)

11. Write short notes on any *three* of the following : 3 × 5

    a) Vortex Flowmeter

    b) Shielding

    c) Capacitive Level Detector

    d) Flow nozzles

    e) Target Flowmeter.

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