	Utech
Name :	
Roll No.:	A dynamic (y' Kamalalay Stall Excillent)
Invigilator's Signature :	

CS/B.Tech (ICE)/SEM-6/IC-603/2011 2011

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 :

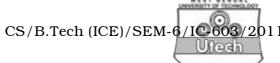
 $10 \times 1 = 10$

- i) A flowmeter whose output is independent of fluid density is
 - a) turbine flowmeter
 - b) electromagnetic flowmeter
 - c) venturimeter
 - d) orifice meter.
- ii) Which of the flowmeters has the lowest pressure drop for a given range of flow?
 - a) Orifice meter
- b) Venturimeter
- c) Flow nozzle
- d) Rotameter.

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j	iii)	Shie	elding is used to block	(A			
		a)	electrostatic field	b)	magnetic	field		
		c)	EMI	d)	all of the	ese.		
j	iv)	In fl	n float type liquid level measurement, the density of the					
		float	at					
		a)	> liquid					
		b)	< liquid					
		c)) = liquid					
		d)	does not depend on liquid density.					
,	v)	The Zener barrier is used in						
		a)	flame proof instrument					
		b)	intrinsically safe instrument					
		c)	electromagnetic instrument					
		d) none of these.						
,	vi)	Hot	Hot wire anemometers are used for measurement of					
		a)	gases					
		b)	solids					
		c)	solid containing liquid					
		d)	liquid containing solid					



- vii) In area flowmeter
 - a) restriction area is kept constant
 - b) differential head is held constant
 - c) volume is kept constant
 - d) surface area is kept constant.
- viii) 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 and capacitance.
- ix) To avoid ground loop, we can use
 - a) single point ground b) ground bus
 - c) ground plane d) none of these.
- x) Laser based level measurement depends on
 - a) accurate direction of the time it takes for a light pulse to travel to the process material surface and back
 - b) the velocity of light
 - c) X-ray radiation
 - d) none of these.

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- xi) The type excitation to produce magnetic field used in the electromagnetic flowmeter is
 - a) A.C.

- b) D.C.
- c) pulsating D.C.
- d) A.C. and D.C.
- xii) The basic principle of float type of level sensor is
 - a) force balance
- b) motion balance
- c) energy balance
- d) none of these.

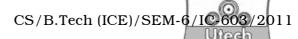
GROUP – B (Short Answer Type Questions)

Answer any three of the following.

 $3 \times 5 = 15$

- 2. Explain the principle of operation of typical vortex flowmeter and show output is linearly related with vortex frequency. Discuss its ranges and features. 3 + 2
- 3. How many types of flow profiles are in a flowing fluid? Define each of them with proper diagram. How are they related with Reynolds number? 1+3+1
- 4. a) What do you mean by intrinsic safety?
 - b) How Zener barrier is used for intrinsic safety? 1 + 4
- 5. Describe with neat sketch the construction and working of optical method of level measurement.
- 6. What is the basic difference between float type and displacer type level indicators? Write down the disadvantages of direct level measurement system. 3 + 2

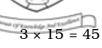
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GROUP - C

(Long Answer Type Questions)

Answer any three of the following.



- 7. a) What is Coriolis acceleration? How is it used in mass flow rate measurement? Discuss its merits and demerits.
 - b) With neat diagram, explain the working of turbine flowmeter and point out its limitations. 2 + 5 + 2 + 6
- 8. a) Describe with a neat sketch, the working principle of float type level measurement method.
 - b) What are the different types of thermal level sensor?

 Where is it used? Explain the method of level measurement using one of them.
 - c) A two-wire pressure transmitter of range $0-4kg/cm^2$ is used for measuring the level of water in a tank. The space above the level is filled with water vapour of $2 \ kg/cm^2$ pressure. Calculate the output current of the transmitter if the water level in the tank is 5 metre when pressure transmitter is installed,
 - i) just at the bottom level of the tank
 - ii) 5 metre below the bottom of the tank
 - iii) 5 metre above the bottom of the tank. 5 + 5 + 5

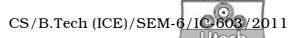
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- 9. a) Explain with neat diagrams, the working of electromagnetic flowmeter. Write down its advantages.
 - b) What are the different direct methods available for liquid level measurement?
 - c) What is NEMA?

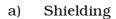
- 4 + 2 + 6 + 3
- 10. a) Prove that the scale of rotameter is linearly related with volumetric flow rate.
 - b) Explain with neat diagram the working principle of venturi tube.
 - c) A transit time based ultrasonic flowmeter is used to measure velocity of a gas flowing in a pipe. In such a case it was found that the zero flow transit time $T_o = 1 \cdot 2$ ms whereas when there was flow the differential transit time was 115 ms. The angle between the flow and the transmitter and receiver unit is 45°. Find the velocity of the gas. sound velocity in that gas if the operating temperature is 500 m/sec. 5 + 5 + 5

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



- b) Ultrasonic level sensor
- c) Radiation type mass flowmeter
- d) Doppler flowmeter
- e) Microwave level switches
- f) Flow nozzles.