	<u>Uflech</u>
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Invigilator's Signature :	

CS / B.TECH (EE-NEW) / SEM-7 / EE-704D / 2010-11 2010-11

POWER PLANT INSTRUMENTATION & CONTROL

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) Bourdon pressure gauges have near elliptical cross-section and the tube is generally bent into C-shape or arc length of about
 - a) 270°

b) 60°

c) 120°

- d) 90°.
- ii) Reynolds number relating to the inertial and viscous forces of a flowing fluid is given by R =
 - a) $\rho v_2 d/\mu$
- b) $\rho \mu d/v_2$
- c) $v_2 d \mu/\rho$
- d) $\rho v_2 d$.

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- iii) LVDT is a displacement transducer of
 - a) Inductance variable type
 - b) Capacitance variable type
 - c) Resistance variable type
 - d) Inductance and Capacitance variable type.
- iv) The flame temperature of a coal-fired boiler is measured by
 - a) Resistance thermometer
 - b) Thermocouple thermometer
 - c) Optical radiation pyrometer
 - d) None of these.
- v) A pH meter measures
 - a) Hydrogen content in the boiler water
 - b) Acidity of the water only
 - c) Alkalinity of the water only
 - d) Acidity and alkalinity.
- vi) Flow nozzles are generally made of
 - a) Phosphor bronze
- b) Nickel
- c) Cast iron
- d) Stainless steel.
- vii) The temperature of steam at superheater inlet and outlet is measured by

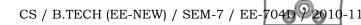
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- a) Thermometer
- b) Thermocouple

c) RTD

d) Pyrometer.

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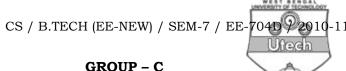
- viii) For measurement of main steam flows which of the following sensing elements is used
 - a) Orifice plate
- b) Flow nozzle
- c) Piltot tube
- d) Ultrasonic flow sensor.
- ix) Hydra step of measurement of boiler drum level is
 - a) Capacitance type instrument
 - b) Conductivity type instrument
 - c) Differential pressure sensor
 - d) Load cell type instrument.
- x) Oxygen analyzer operates on the principle of
 - a) Infrared radiation
 - b) Piezoelectricity
 - c) Paramagnetic property
 - d) Ultraviolet radiation.
- xi) A resistance thermometer is used for precision measurement
 - a) below 150°C
- b) above 150°C
- c) above 500°C
- d) none of these.

GROUP - B

(Short Answer Type Questions)

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

- 2. Describe the working principle of pH meter.
- 3. Design the instrumentation system of weighing coal transported by conveyor belts.
- 4. Why is the analysis of flue gas necessary? Briefly describe the working principle of infrared ty CO-analyser.
- 5. Explain with sketch a mass flowmeter.
- 6. Draw the block diagram of different parts of a Power Plant.



(Long Answer Type Questions)

Answer any three of the following.

 $3 \times 15 = 45$

- 7. Discuss the techniques adopted to measure temperature in
 - a coal fired thermal plant and
 - b) in a nuclear plant.
- 8. What is draft gauge? Where is it used in a power a) plant?
 - Why is furnace draft kept below atmospheric b) pressure?
 - Describe the furnace draft control of a modern boiler. c)

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- 9. Explain with Control Loop diagram three element drum level control of a thermal power plant.
- 10. Discuss the principles of operation of different types of 'Flow-meters' used in power plants and indicate specific examples of their use in power plants. State their limitations in the measurement process.
- Write short notes on any three of the following: 3×5 11.
 - Capacitance type level measurement
 - LVDT b)
 - Rotameter c)
 - d) Piezoelectric transducer
 - Data logger in power plant. e)

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