



Name :

Roll No. :

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 × 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) $\rho v_2 d$.



- 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
- a) Thermometer b) Thermocouple
 - c) RTD d) Pyrometer.



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

GROUP – B

(Short Answer Type Questions)

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

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



GROUP – C

(Long Answer Type Questions)

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

7. Discuss the techniques adopted to measure temperature in
 - a) a coal fired thermal plant and
 - b) in a nuclear plant.
 8. a) What is draft gauge ? Where is it used in a power plant ?
 - b) Why is furnace draft kept below atmospheric pressure ?
 - c) Describe the furnace draft control of a modern boiler.
- $4 + 3 + 8$
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.
 11. Write short notes on any three of the following : 3×5
 - a) Capacitance type level measurement
 - b) LVDT
 - c) Rotameter
 - d) Piezoelectric transducer
 - e) Data logger in power plant.

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