



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH (EE)/SEM-7/EE-704D/2012-13

2012

POWER PLANT INSTRUMENTATION AND 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 the following : $10 \times 1 = 10$

i) The heat of a nuclear power plant is the

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|--------------------|-------------------|
| a) nuclear reactor | b) heat exchanger |
| c) nuclear fuel | d) control rod. |

ii) Which of the following flow meters has the highest pressure drop for given range of flow ?

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|------------------|------------------|
| a) Orifice meter | b) Venturi meter |
| c) Flow nozzle | d) Rotameter. |

iii) Economizer is used to heat

- | | |
|---------------|------------------|
| a) air | b) feed water |
| c) flue gases | d) all of these. |



- iv) The analyzer cell where a third electrode may be added to life of the cell is
- a) zirconia fuel cell b) polarographic cell
c) hot wire TCD analyzer d) hersh cell.
- v) pt-100 RTD means temperature bulb having
- a) 0 ohm at °C b) 100 ohm at 100°C
c) 100 ohm at °C d) 0 ohm at 100°C.
- vi) A thermocouple with reference junction temperature at 20°C gives an output of 5 mV. If the thermocouple sensitivity is 50 $\mu\text{V}/^\circ\text{C}$
- a) 100°C b) 80°C
c) 120°C d) 20°C.
- vii) Which power plant is economical ?
- a) Thermal b) Nuclear
c) Hydel d) Gas power plant.
- viii) ESP is used to control
- a) CO in air b) SPM in air
c) CO₂ in air d) SO_x / NO_x in air.
- ix) The basic principle of the float type level sensor is
- a) force balance b) motion balance
c) energy balance d) none of these.
- x) The amount of excess air for combustion of coal is around
- a) 5% b) 10%
c) 15% d) 20%.



GROUP – B

(Short Answer Type Questions)

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

2. a) Explain the working of metallic diaphragm with neat sketch. How does the sensitivity of a diaphragm can be increased ?
b) State the principle of operation of piezoresistance type pressure sensor. $3 + 2$
3. Describe heat engines based on Carnot cycle. Name at least three other machines which utilize the mechanism of energy conversion. $2 + 3$
4. Draw a labelled sketch diagram of C-type Bourdon tube pressure gauge and explain its principle operation.
5. Describe the supervisory control system with suitable diagram.
6. Explain the operating principle of optical pyrometer with proper diagram. Also mention its range and advantages.

GROUP – C

(Long Answer Type Questions)

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

7. a) How can the capacitive transducer be used to measure the level of non-conducting liquid ? What special arrangement should be done while measuring the level of conducting liquid ?
b) What do you mean by frequency response of a capacitive transducer ? Mention different factors on which capacitive transducer depends. $7 + (5 + 3)$

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8. Explain the different components of power plant and safety instrumentation. 8 + 7
9. a) Explain what you understand by pH of a solution.
b) How is pH measured in the laboratory ?
c) What is the precaution required to be taken in case of measurement of pH ? 2 + 10 + 3
10. a) Design and briefly describe the instrumentation system of a typical deaerator plant with proper control loop.
b) Explain the method of dissolve oxygen content. 7 + 8
11. Write short notes on any *two* of the following : 2 × 7½
- a) DP transmitters
b) Combustion control of a furnace
c) Radiation pyrometer
d) Thomson effect.

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