



Name :

Roll No. :

Invigilator's Signature :

**CS/B.Tech(ICE)/SEM-8/IC-801C/2012
2012**

POWER PLANT INSTRUMENTATION

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

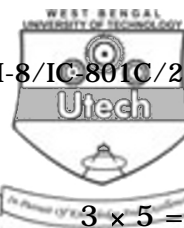
*Candidates are required to give their answers in their own words
as far as practicable.*

**GROUP – A
(Multiple Choice Type Questions)**

1. Choose the correct alternatives for the following : $10 \times 1 = 10$
 - i) UV detector is used to measure the temperature of
 - a) Boiler metal tube
 - b) Furnace flame
 - c) Feed water
 - d) Steam.
 - ii) SO_x & NO_x emission is determined by
 - a) Gas chromatography
 - b) NDIR analyzer
 - c) Zirconia probe
 - d) Balance.
 - iii) In fire tube boiler, the fluid exists outside the capillary tube is
 - a) Hot flue gas
 - b) Natural water
 - c) DM water
 - d) Steam.
 - iv) A full tidal cycle is of the duration of
 - a) 6 hrs
 - b) 12 hrs
 - c) 12 hrs 25.2 min
 - d) 24 hrs.



- v) Which one of the following is not an element of hydroelectric power plant ?
- a) Catchment area b) Surge tanks
- c) Powerhouse d) Evaporator.
- vi) The function of a flue gas analyzer is to indicate the
- a) fuel / air ratio burned in the furnace
- b) temperature of the flue gas
- c) grade of fuel being used
- d) all of these.
- vii) Power output of a wind turbine generator is proportional to
- a) V b) V^2
- c) V^3 d) V^4 .
- (V is wind velocity).
- viii) The furnace temperature can measure by using
- a) RTD
- b) Thermocouple
- c) Bimetallic Thermometer
- d) none of these.
- ix) ESP is used to control
- a) CO in air b) SPM in air
- c) CO_2 in air d) $\text{SO}_x / \text{NO}_x$ in air.
- x) Air velocity in ducts is measured by
- a) Venturimeter b) Pitot tube
- c) Orifice plate d) LVDT.



GROUP - B
(Short Answer Type Questions)

Answer any *three* of the following.

3 × 5 = 15

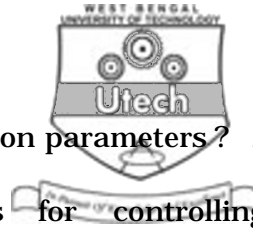
2. a) Explain B-T-C-P cycle of Steam Power Plant. 3
b) What are the advantages of Condenser in Steam Power Plant ? 2
3. Why is 3-element control employed for drum level control ?
With net control loop diagram explain the 3-element control. 2 + 3
4. How is a liquid level in a boiler drum measured ? Explain.
5. Mention where are vibration, expansion & contraction to be measured & monitored in a power plant cycle. What technique is used usually for expansion-contraction measurement ?
6. What is hydrazine ? Why is it used in water/system cycle in a power plant ?

GROUP - C
(Long Answer Type Questions)

Answer any *three* of the following.

3 × 15 = 45

7. What is balance draft ? How is the draft of the furnace measured ? Draw a loop for control of the furnace draft & explain its operation. 2 + 3 + 10
8. Write short notes on any *three* of the following : 3 × 5
 - a) Quality monitoring of water in power plant
 - b) Single element drum level control
 - c) All fuel ratio control of a furnace
 - d) Instrumentation in coal handling plants.



9. a) What are the important boiler protection parameters ? 2
- b) What are the different methods for controlling superheated steam temperature ? 3
- c) With a neat control loop diagram, explain the steam temperature control by using two stage de-superheater. 6
- d) How the pH and dissolved oxygen can be measured for feedwater ? 4
10. a) What are the measurand and manipulated variables in 3-element boiler drum level control ? 2
- b) How are swelling and shrinking problems taken care by 3-element drum level control ? 7
- c) Explain with neat sketch, the alarm annunciation system of a boiler in thermal power plant. 6
11. a) Which control strategy is adopted in boiler combustion control ? Explain it with control flow chart. Why is O_2 trimming required in combustion control ? 1 + 6 + 2
- b) What are the criteria for development of waste heat recovery system in a power plant ? Explain the working principle of any one waste heat recovery system used in thermal power plant. 2 + 4