POWER PLANT INSTRUMENTATION AND CONTROL (SEMESTER - 8)

CS/B.TECH (ICE)/SEM-8/IC-801C/09

1. .....
Signature of Invigilator

2. .....
Signature of the Officer-in-Charge

Reg. No. | | | | | | | | | | | | | | |

Roll No. of the Candidate | | | | | | | | | | | | | | |

CS/B.TECH (ICE)/SEM-8/IC-801C/09

ENGINEERING & MANAGEMENT EXAMINATIONS, APRIL – 2009

POWER PLANT INSTRUMENTATION AND CONTROL (SEMESTER - 8)

Time : 3 Hours] [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question**.
   b) For **Groups – B** & **C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

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Marks Obtained

	Group – A										Group – B			Group – C			***Total Marks***	***Examiner's Signature***
Question Number																		
Marks Obtained																		

.....
Head-Examiner/Co-Ordinator/Scrutineer

8863 C/C (25/04)

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GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : 10 × 1 = 10

i) A full tidal cycle is of the duration of

a) 6 hrs b) 12 hrs

c) 12 hrs 25·2 min d) 24 hrs. ☐

ii) Which one of the following is not an element of hydroelectric power plant ?

a) Catchment area b) Surge tanks

c) Powerhouse d) Evaporator. ☐

iii) 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. ☐

iv) The functon of the nozzle diaphragm (gas turbine engine) located on the upstream side of the turbine wheel is

a) to increase the pressure of the exhaust mass

b) to increase the velocity of the heated gases flowing past the nozzle diaphragm

c) to direct the flow of gases parallel to the chord line of the turbine buckets

d) to decrease the velocity of the heated gases flowing past the nozzle diaphragm. ☐

v) The major pollutant gases existing in flue gas are

a) NO_X and SO_2 b) CO_2 and CO

c) CO and NO_X d) none of these.

vi) 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).

vii) The furnace temperature can measure by using

a) RTD b) Thermocouple

c) Bimetallic Thermometer d) none of these.

viii) Saturated steam will flow at velocity of

a) up to 40 km/hr b) up to 70 km/hr

c) up to 100 km/hr d) up to 140 km/hr.

ix) Absolute shaft vibration measurement for turbine is needed

a) if turbine operate by gas

b) if the turbine operate by steam

c) if the rotating assembly is five heavyier than the case of the machine

d) for each turbine.

x) In thermal power plant maximum energy lost in

a) furnace b) boiler drum

c) condenser d) attemperator

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Name the different components of nuclear reactor. What is breeding in nuclear reactor ? 3 + 2

3. a) What are the important turbine protection parameters ? 2

   b) Why is vibration measurement essential for turbine control system ? 3

4. Briefly explain the mechanical type de-aeration for the removal of non-condensable gases from boiler feedwater. 5

5. a) Explain B-T-C-P cycle of Stem Power Plant. 3

   b) What are the advantages of Condenser in Steam Power Plant ? 2

6. Why is 3-element control employed for drum level control ? With net control loop diagram explain the 3-element control. 2 + 3

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following questions. 3 × 15 = 45

7. a) What are the important boiler protection parameters ? 2

   b) What are the different methods for controlling superheated steam temperature ?

   c) With a net 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

8. 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

9. a) What are the main auxiliary system of the thermal power plant ? 3

b) With a block diagram explain the operation of coal handling unit & mention the important parameters which are to be monitored and controlled in each location. 8

c) Explain the method for measuring the dust particle in the flue gas. 2

d) Explain the procedure to collect the ash in ESP. 2

10. 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 critcria 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

11. a) What are the important local measuring point of a particular boiler ? 3

b) Explain with a suitable diagram and instrument for local measurement of the following : 4 × 3

i) Boiler body temperature

ii) Furnace temperature

iii) Steam flow from boiler

iv) Water level of boiler.

END