Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH (ICE)/SEM-8/IC-801C/2013

2013

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 any *ten* of the following :

$10 \times 1 = 10$

i) Which one of the following is not a fuel for nuclear poneer plant

a) $_{92}U^{233}$ b) Coal

c) $_{92}U^{235}$ d) $_{94}Pu^{239}$.

ii) Which one of the following is a component of nuclear reactor ?

a) Moderator b) Boiler

c) Turbine d) Superheater.

iii) Temperature of the fireball is of the

a) 540°C b) 460°C

c) 1500°C d) 150°C.

iv) Furnace draft pressure is regulated by

a) Radial control of FD fan

b) Axial control of FD fan

c) Radial vane control of ID fan

d) Axial vane control of ID fan.

v) Maximum heat loss in a thermal power plant occurs in

a) condenser b) superheater

c) turbine d) none of these.

vi) Which one of the following is a low head and high discharge turbine ?

a) Kaplan turbine b) Pelton turbine

c) Deriaz turbine d) Francis turbine.

vii) The fanction of superheater is

a) heating water to produce steam

b) removing water droplets from steam and thereby producing superheated steam.

c) to reheat feed water

d) none of these.

viii) The extraction turbine is useful

a) when only one output of steam is needed

b) when two or more outlets are provided to use the steam for different uses.

c) when steam at very low pressure is needed

d) all of these.

ix) The power of a wind turbine generator is proportional to

a) V b) V^2

c) V^3 d) V^4.

[V is the wind velocity]

x) The function of a deaerator is

a) to reheat feed water

b) to eliminate dissolved O_2 & CO_2 from feed water

c) to heat steam

d) all of these.

xi) Which one of the following can be used as a pollution monitoring device ?

a) Gas chromatograph

b) RTD

c) Thermocouple

d) None of these.

xii) In a multiple burner system which one is best flame detector ?

a) Flame Ionization Rod

b) IR detectors

c) UV detectors

d) All of these.

GROUP – B

(Short Answer Type Questions)

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

2. State the different components of a nuclear power plant ? What are the advantages and disadvantages of CANDU (Canadium deuterium uranuim) reactor ? 2 + 3

3. How pH and dissolved oxygen can be measured from feed water in a thermal power plant ?

4. What are the process parameters that must be measured for a turbine ? Why is vibration measurement essential for turbine ? Describe the process of vibration measurement in a turbine. 1 + 2 + 2

5. Theoretically calculate the power that can be obtained from a windmill having the following specifications :
(Assume the density of air is 1.2 kg/m^3)

A = Swept Area = 10 m^2

V = Velocity of wind = 200 km/hr.

Calculate the rate of make up water to a boiler plant if the average feed water rate is 100T/hr, the water loss in the baler system including blow down is 3% of the input and the steam loss in the turbine is 2% of its input. 2 + 3

6. What is blow down ? Name the three different drafts in case of boiler ? Describe the process of controlling of any nuclear reactor. 1 + 1 + 3

GROUP – C

(Long Answer Type Questions)

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

7. a) Explain the B-T-C-P cycle of a steam power plant. 3

b) How are the shrinking and swelling problems taken care of in a steam power plant by using 3-element boiler drum level control. 6

c) Describe the process of steam flow measurement in a boiler. 6

8. a) Describe the process of feed forward plus feedback steam temperature control. 7

   b) Describe the different processes used for the measurement of dissolved oxygen in a boiler. 8

9. a) Explain the method of measuring dust particle in flue gas. 2

   b) Explain with a neat sketch the alarm annunciation system of a boiler in a thermal power plant. 7

   c) With a neat sketch describe the role of attemperator in the water side steam temperature control in a thermal power plant. 6

10. a) Name the classification of turbines based on process conditions. 2

    b) What are the basic differences between the safety control systems and process control system in a turbine ? 3

    c) Name the four critical parameters which are to be monitored and controlled in a turbine. 2

    d) Describe the method of conductivity measurement of feed water in a thermal power plant. 5

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

11. Write short notes on any *three* of the following : 3×5

a) Electrostatic Precipitator

b) Fast breed reactor

c) Infrared flue gas Analyzers

d) Measurement of CO_2 in flue gas.

e) Advantages of three-element drum level control over two-element drum level control.

f) Mechanical type dust collectors.