B.TECH/AEIE /7TH SEM/AEIE 4143/2019

POWER PLANT INSTRUMENTATION

(AEIE 4143)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

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

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) Secondary air is supplied by
(a) FD fan (b) ID fan both
(c) FD fan and ID fan (d) None of these.

(ii) Minimum percentage of excess air required for coal fired furnace is below
(a) 3% (b) 3-15% (c)15-25% (d) 25-40%.

(iii) The air used to transport dry coal into the furnace is termed as
(a) Secondary air (b) Primary air
(c) Excess air (d) Flue gas.

(iv) Match the followings (cause-effect)

(1) Feed water Hardness	A. Corrosion
(2) Dissolve Oxygen, low pH	B. Coagulation
(3) Suspended solids, oils, greases, fats etc	C. Scale formation
(4) Alum	D. Foaming

(a) 1-C, 2-D, 3-B, 4-A (b) 1-C, 2-A, 3-D, 4-B
(c) 1-A, 2-D, 3-C, 4-B (d) 1-B, 2-C, 3-D, 4-A.

(v) The function of moderator in a nuclear reactor is to
(a) slow down the fast moving neutrons
(b) speed up the fast moving neutrons
(c) start the chain reaction
(d) transfer heat produced inside the reactor to a heat exchanger.

(vi) Zirconium probe is commonly used to analyze _____ content of flue gas.
(a) CO_2 (b) O_2 (c) NO_x (d) SO_x.

(vii) Swelling of boiler drum level occurs when
(a) load demand decreases (b) load demand increases
(c) boiler pressure increases (d) all of the above.

(viii) In a steam power station, the choice of high temperature steam is for
(a) increasing the efficiency of boiler alone
(b) increasing the efficiency of turbine alone
(c) increasing overall efficiency
(d) none of the above.

(ix) The modern steam turbines are
(a) Impulse turbines (b) Reaction turbines
(c) Impulse-reaction turbines (d) None of the above.

(x) In hydel power plant _____ energy is converted into mechanical energy
(a) Potential energy (b)Kinetic energy
(c) Wind energy (d)Both potential and kinetic energy

Group – B

2. (a) Explain how Rankine cycle works in steam power plant with respect to P-V and T-S diagram. Hence derive the expression for efficiency of the cycle.

(b) Outline the unit system used in pulverised coal handling plant.

(6 + 2) + 4 = 12

3. (a) Briefly discuss the feedwater and steam flow circuit of a thermal power plant with a suitable block diagram.

(b) State the function of an economiser.

(4 + 4) + 4=12

Group – C

4. (a) Analyse the reason behind maintaining of negative atmospheric pressure in furnace? With suitable PI diagram explain how FD fan dampers are used for furnace draft control?

(b) How the liquid level of a pressurised tank can be measured?

(3 +5) + 4 =12

5. (a) Describe the operation of attemperator with necessary diagram.

(b) Why it is important to control the level of hot-well? Hence describe the method of hot-well level control loop with suitable PI diagram.

4 + (2 + 6) =12

Group – D

6. (a) Why purging is necessary before firing of furnace?

(b) State the boiler tripping/shutdown conditions.

(c) Describe the measurement method of turbine axial shift with suitable schematic diagram.

3+ 4 + 5 = 12

7. (a) How does speed of turbine varies with load demand? Describe with neat sketch, the control mechanism of turbine speed.

(b) Explain the lube oil temperature control loop with suitable PI diagram.

(2 + 6) + 4 =12

Group – E

8.(a) Classify different types of feedwater impurities. Describe how impurities cause corrosion?

(b) Describe two mechanical methods for feedwater treatment.

(4+4)+4=12

9.(a) How burner tilting mechanism can be used to reduce generation of NO_X.

(b) How moderator helps in nuclear reactor?

(c) State the functions of trash rack and surge tank used in hydro power plant.

4+ 4 + 4 =12