2012

THERMAL POWER PLANT OPERATION AND MAINTENANCE

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) In a coal based modern thermal power station time required from light up to synchronization during cold start up under normal operating conditions considering all equipment availability is

a) 2 Hrs b) 3 Hrs

c) 4 Hrs d) 5 Hrs.

ii) In the pre-check for boiler light up, it is to be ensured that the

a) safety valves are gagged

b) drum vent is closed

c) soot blowers are in advanced position

d) none of these.

iii) A boiler gas pass is purged before light up in order to

a) warm up the gas pass

b) cool down the gas pass

c) remove deposits from metal surface

d) remove unburnt combustibles from boiler.

iv) Which is not the critical speed of the turbine ?

a) 1585 rpm b) 2489 rpm

c) 2879 rpm d) 1881 rpm.

v) If high pressure turbine, metal temperature is above

350° C, the type of start to be chosen is

a) hot start b) warm start

c) cold start d) none of these.

vi) During the following condition Boiler trip automatically

a) floating of Boiler drum safety valve

b) high super heater metal temperature

c) re-heater steam temperature becomes less than

super heated steam temperature

d) very high furnace draft.

vii) The steam turbine will automatically trip due to

a) more than 12% condensation in LP stages

b) high vibration (8 micron) in bearings

c) lub. oil pressure less than 0·3 kg/cm2

d) none of these.

viii) Which of the following functions is not included in the

Furnace safeguard supervisory system ?

a) Boiler trip protection

b) Flame scanner intelligence and checking

c) Coal Mill fineness control

d) Secondary air modulation control and supervision.

ix) The desirable specific fuel oil consumption is Boiler

a) between 3 to 5 ml/kWhr

b) around 1 ml/kWhr

c) around 10 ml/kWhr

d) none of these.

x) Signature Analyser is used to determine

a) vibration parameters in static condition

b) vibration parameters in dynamic condition

c) leakage

d) crack.

GROUP – B

(Short Answer Type Questions)

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

2. What is FSSS ? How the auxiliary air dampers are modulating in a tangential fired Boiler ?

3. What are the losses taking place in Boiler and how to minimize the losses ?

4. What are the operations to be followed if turbine control valves suddenly closes during normal operation of a power plant ?

5. Write the roles of Recirculation line, Balance leak off line and Hydraulic coupling with scoop control in a BFP operation.

6. What are the pick ups measured and their units to identity the vibration level of a moving equipment ? What principle is used in the vibration measuring probe ? What are the NDT techniques used for surface crack and sub surface crack detection ?

GROUP – C

(Long Answer Type Questions)

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

7. a) Write down the pre-start checks to be performed before Boiler light up.

b) What is the purpose of steam blowing in main steam line during commissioning and how is it performed ?

8 + 7

8. a) What are the cause of vibration in power station equipment ?

b) Describe the protections used in steam turbine operation.

c) Write down the sequential steam rolling operation of LMW/KWU turbine up to synchronization. 5 + 5 + 5

9. a) In between Boiler drum safety valve and super heater safety valve, which one will pop first during pressure rising and why ? What would be your action ?

b) What are the advantages of super critical Boiler over sub critical Boiler ?

c) What are the factors affecting Coal Mill performance ?

5 + 5 + 5

10. a) Define maintenance and write the classification of maintenance.

b) Prove that the ideal replacement time reaches when current maintenance cost of an equipment becomes equal to average annual maintenance cost.

c) "Condition Based Maintenance is desirable than Schedule Maintenance". Justify your answer with bath tub curve and cost consideration. 5 + 5 + 5

11. a) Name the ten performance parameters which needs continuous monitoring in Thermal Power Station.

b) Calculate the Boiler efficiency on the basis of the following data available in a PF fired Boiler at full load condition.

Coal Analysis : Moisture —15%, Ash —38%,

Hydrogen —1·83%, Sulpher —1·12%, Total Carbon —44%,

GCV—20,910 kJ/kg.

APH outlet gas temperature—140° C

FD fan inlet air temperature—25° C

CO_2 at APH = 13·75%

O_2 at APH = 5·4%

Combustible in Fly Ash = 0·81%

Combustible in bottom Ash = 0·54%.