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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

Program:	B.Tech PSE	Semester	: V
Subject (Course):	Steam Generator, its Auxiliaries & BOP	Max. Marks	: 100
Course Code :	PSEG 310	Duration	: 3 Hrs
No. of page/s:	2		

SECTION A (5Q x 4= 20 Marks, Attempt All)

- Q1. [CO1] List out the advantages of using ‘Pulverized Coal’ in Boiler furnace. Explain along with figure any two types of Coal Pulverizers used in a Thermal Power Plant.
- Q2. [CO2] A steam power plant uses coal 5000 Kg/ Hr. The heat conversion efficiency is 30% and the calorific value of coal is 7000 Kcal/ Kg. Calculate the electric energy produced per day. (Note: 1 KWh = 860 Kcal)
- Q3. [CO1, 3, 4] Explain the importance of ‘Gravity Take-up Unit’ in a Coal Conveyor.
- Q4. [CO1] Explain the following terms (w.r.t Water Treatment Plant in Thermal Power Plants):
- De-gasifier
 - SBA
 - SAC
 - ACF
- Q5. [CO2] State the differences between LDO & HFO when used as Boiler Start-up fuel.

SECTION B (4Q x 10= 40 Marks, Attempt All)

- Q6. [CO1, 3] Explain with the help of Single Line Diagram (SLD), the total arrangement of the ‘Internal Coal Handling Plant’ for 2 x 600 MW Thermal Power Plant using bituminous coal.
- Q7. [CO1] Explain in detail the major advantages & disadvantages of “High Concentration Slurry Disposal System (HCSD)” over “Lean Slurry Ash Disposal System?”
- Q8. [CO1, 2] With the help of an appropriate flow scheme, explain the ‘Water Treatment Plant’ for a Coal based Thermal Power Plant having a raw water storage reservoir.
- Q9. [CO3, 4] With the help of the Rankine Cycle, explain how a super-critical boiler improves the efficiency of the system when compared with a subcritical boiler.

SECTION C (2Q x 20 = 40 Marks, Attempt All)

Q10. [CO1, 4]With reference to Boiler Bottom Ash Evacuation system, explain (with the help of SLD) the difference between the following:

- a. Bottom Ash Evacuation using 'Scraper Chain Conveying' system
- b. Bottom Ash Evacuation using 'Jet Pump Evacuation' system

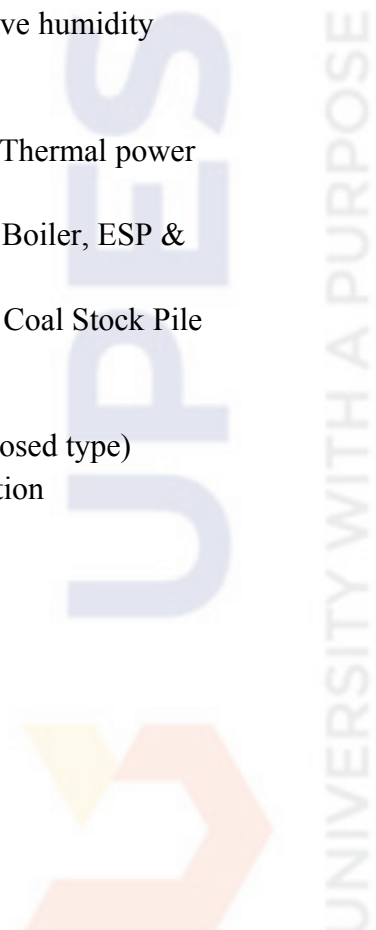
Q11. [CO2] During meeting with the customer, the following plant data were provided:

- Fuel used = Anthracite variety of Indian coal of high Calorific Value
- Power Plant location = Pit Head (near to Coal mine)
- Raw water availability = Limited
- Ash Pond area = 15 Km from plant
- Power evacuation point = Towards North of the Power Plant site
- Plant site ambient cond. = Warm & humid with high relative humidity
- Wind direction = North to South

Discuss the consideration required for making plant layout for a 2x600 MW Thermal power plant with reference to the following:

- a) Indicate the Main Plant Block (Transformer Yard, TG- Building, Boiler, ESP & Chimney)
- b) Coal Handling System (both Ext. CHP & Int. CHP) & size of the Coal Stock Pile storage area (in days) & its location
- c) Size of the Raw Water reservoir within the plant
- d) Type of Condenser Cooling Water (CW) system (Open type or closed type)
- e) Type of Ash evacuation system & Ash Pond size along with location

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SECTION A (5Q x 4= 20 Marks, Attempt All)

- Q1. [CO1] State the advantages of Super-critical Boiler over sub-critical Boiler.
- Q2. [CO2] Explain the principle function of De-superheater/ Attemperator used in a Boiler along with flow scheme.
- Q3. [CO1, 2, 3] The daily output of a steam power station is 18×10^5 KWh. If the coal consumption is 700 Tons/ Day, calculate the thermal efficiency of power station.
(Note: 1 KWh = 860 Kcal)
- Q4. [CO1] Explain with appropriate figure the schema of Fuel Oil Handling plant for HFO from Main Oil Storage Tank to Boiler.
- Q5. [CO2] Explain the following terms w.r.t Steam Generator (Boiler) operation:
1. Rotary Soot Blower
 2. Retractable Soot Blower

SECTION B (4Q x 10= 40 Marks, Attempt All)

Q6. [CO1, 3] Explain with **Single Line Diagram (SLD)** the arrangement of the “**External CHP (Coal Handling Plant)**” of a 2 x 500 MW Thermal Power Plant using imported coal along with the major equipment that is applicable.

Q7. [CO1] With the help of appropriate figure, explain the difference ‘**Single Acting**’ & ‘**Double Acting**’ Air Compressor along with advantages/ disadvantages w.r.t

- a. Mechanical Efficiency
- b. Floor Area Space requirement
- c. Electrical Auxiliary Power consumption

Q8. [CO1, 2] State the benefits of disposal of Boiler Fly Ash in dry form. Enumerate five major utilization of Boiler Fly Ash when disposed in dry form.

Q9. [CO3, 4] Explain with appropriate figure the difference between

1. Gravimetric Coal Feeder
2. Volumetric Coal Feeder

SECTION C (2Q x 20 = 40 Marks, Attempt All)

Q10. [CO1, 4] Using the Single Line Diagram (SLD), explain the techniques used for “**Boiler Fly Ash disposal**” along with all the major equipment used in

- 1) Lean Phase (Vacuum) Fly Ash Evacuation system
- 2) Dense Phase Fly Ash Evacuation system

Q11. [CO2] During meeting with the customer, the following plant data were provided:

- Fuel used = Bituminous variety of Indian with high Calorific Value
- Power Plant location = Load Centric
- Available raw water source = Unlimited
- Ash Pond area = 4 Km from plant
- Power evacuation point = Towards South of the Power Plant site
- Plant site ambient condition = Cold & Dry with Low relative humidity
- Wind direction = South to North

Discuss the consideration required for making plant layout for a 2x600 MW Thermal power plant with reference to the following:

- f) Indicate the Main Plant Block (Transformer Yard, TG- Building, Boiler, ESP & Chimney)
- g) Coal Handling System (both Ext. CHP & Int. CHP) & size of the Coal Stock Pile storage area (in days) & its location
- h) Size of the Raw Water reservoir within the plant
- i) Type of Condenser Cooling Water (CW) system (Open type or closed type)
- j) Type of Ash evacuation system & Ash Pond size along with location

