



**Government Engineering College, Dahod**

**સરકારી ઇજનેરી કોલેજ.દાહોદ**



**MECHANICAL ENGINEERING DEPARTMENT**

**ASSIGNMENT-JUNE-2019**

**B.E.SEMESTER: VII (DIV-A & B)**

**SUBJECT: - POWER PLANT ENGINEERING (PPE)**

**SUBJECT CODE: 2171910**

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**Assignment 1 Thermal power plant**

- 1 Write explanatory note on layout of a modern thermal power station including main circuit and path flow.
- 2 Give the site selection criteria for thermal power plant.

**Assignment 2 Steam Turbine**

1. Give detailed classification of steam turbine.
2. What do you understand by impulse turbine & Reaction turbine?
3. What do you understand by compounding of steam turbine? State the different methods of compounding of steam turbine and explain with neat sketch velocity compounded impulse steam turbine.
4. Explain the pressure compounded impulse steam turbine with neat sketch and give advantage and disadvantage of the same.
5. Define blade efficiency and hence derive an expression for maximum blade efficiency for a single stage impulse turbine.
6. Define degree of reaction and show that degree of reaction  $R = \frac{V_f (\cot\phi - \cot\theta)}{2V_b}$
7. Explain Parson's Reaction turbine. Why it is called 50% Reaction turbine?
8. Explain 'Reheat factor' & 'internal efficiency'. Derive the relation between stage efficiency, internal efficiency and reheat factor.
9. List the different losses occurring in steam turbine. Explain the concept of any one with neat sketch.
10. For an impulse turbine, explain the following terms and also obtain expression for them:

(i) Power (ii) Axial Thrust (iii) Blade efficiency

11. What is Willans line?

12. Justify the statement “Back pressure and pass out turbines are advantageous for power and process work than generating steam for both work separately”.

13. Why the combined power and process heating plant is more efficient?

14. What is the function of steam accumulator? Also explain the operation of the steam accumulator.

### **Assignment 3 Gas & Steam Turbine Combined Cycle Power Plant**

1. State the classification of gas turbine power plant.
2. Explain with neat sketch the open cycle gas turbine power plant. Also show it on T-S diagram and derive an expression for thermal efficiency.
3. Explain with neat schematic diagram the working of closed cycle gas turbine.
4. Define air rate, work ratio and thermal efficiency of gas turbine power plant.
5. Derive the expression for net work done by gas turbine power plant. Also state the condition for maximum work done.
6. Make a list of means for improving the efficiency and specific output of simple gas turbine plant.
7. Explain the effect of Intercooling for simple gas turbine.
8. Explain the effect of regeneration in simple gas turbine.
9. Explain the effect of reheating for simple gas turbine.
10. Explain with neat sketch The Can type combustor with swirl flow flame stabilizer.
11. Derive an expression of combined cycle plant efficiency in terms of topping and bottoming cycle efficiencies.

### **Assignment 4 High pressure boilers and Accessories**

1. Explain with neat sketch Lamont boiler, Super critical boiler.
2. Write short on FBC.
3. Explain Classical and commercial FBC.
4. Give the classification of Economizer and explain plain, Gilled, Tubular and plate type air pre heater.
5. Write short note on regenerative type air preheater.
6. Write various methods for Steam temperature control.

### **Assignment 5 Coal and ash handling**

1. Explain the following systems used in coal transfer.  
Belt conveyor, Screw conveyor, Bucket elevators, Grab bucket elevator, skip hoist, flight conveyor.
2. Give advantages and disadvantages of stoker firing.

3. Explain with neat sketch 'overfeed' and 'Underfeed coal firing.
4. Explain the travelling grate stoker with help of neat sketch.
5. What are the advantages and disadvantages of pulverized coal firing.
6. Explain unit system of pulverized fuel handling with neat sketch.
7. Write short note on ball , hammer , race pulverization mills.
8. Write short note on cyclone seperator.
9. Classify various ash handling plant and explain with neat sketch pneumatic and steam jet ash handling plant.
10. Write short note on ESP.

### **Assignment 6     Draught system**

1. What is draught ? What are the functions of draught system ?
2. Define boiler draught . What are the losses in air gas circuit of boiler ? Explain in details.
3. Give the classification of draught and explain natural and steam jet draught with neat sketch.
4. Give the difference for forced and natural draught.
5. Prove with usual notations that the draught produced in mm of water head by a chimney is given by ,  

$$H_w = 353 H [ 1/T_a - 1/T_g (m_a + 1/ m_a) ]$$
6. Write short note on balanced draught.

### **Assignment 7     Condensers and cooling towers**

1. What re functions of a condenser in a thermal power plant ? Give the classification of condensers. .
2. What is jet condenser? Explain low level Jet condenser.
3. With a net sketch explain the construction and working
4. Compare jet condenser with surface condenser.
5. State the functions and importance of a cooling tower and condenser in thermal power plant and define Vacuum & condenser efficiency.
6. Explain the construction of natural draught cooling tower with diagram and also writes it advantages and limitations.
7. Explain cooling ponds and its types with sketch.

### **Assignment 8     Feed water treatment**

1. Explain the necessity of feed water treatment and what are the impurities in feed water?
2. Explain the effect of impurities in boiler feed water and also explain the term priming and foaming in boiler? What are its effects on boiler ?
3. Write short note on hot soda lime treatment for feed waer.
4. Explain Demineralization plant with neat sketch.
5. Explain the principle and working of a reverse osmosis plant for feed water treatment.

6. Explain sea water treatment using reverse osmosis process.
7. Write short note on deaerator.

### **Assignment 9 Diesel power plant**

1. What are the advantages of diesel power plant over steam power plant.
2. State the field of application of diesel power plant.
3. What are the various factors to be considered while selecting the site for diesel engine power plant? Explain briefly.
4. List the essential auxiliaries of a diesel power plant.
5. Write a note on fuel supply system in the diesel engine power plant.
6. List and explain various types of fuel injection systems.
7. Give classification of engine coolings.
8. Explain with the help of a neat sketch the working of a thermostat cooling system.
9. Why thermo-syphon cooling is not used in diesel power plant.
10. Explain with neat sketch full pressure lubrication system for diesel power plant.
11. Give comparison between wet sump and dry sump lubrication system.
12. Explain with the help of neat sketch the air intake system of a diesel power plant.
13. Define supercharging and state the advantages by it in the diesel engine.
14. Explain with the help of a neat sketch the exhaust system of a diesel power plant.
15. Describe the various methods used for starting diesel engine.

### **Assignment 10 Nuclear power plant**

1. Give comparison of fission and fusion processes.
2. Explain fission chain reaction
3. What do you mean by critical size and critical mass?
4. Give the functions and materials used for following components of nuclear reactor: 1. Fuel 2. moderator 3. reflector 4. control rod 5. biological shield
5. Give the functions and materials used for following components of nuclear reactor: 1. coolant 2. thermal shield 3. reactor vessel
6. State the main components of a nuclear reactor?
7. Explain with neat sketch Pressurized water reactor. Explain functions of pressurizer in PWR.
8. Explain with neat sketch Boiling Water Reactor
9. What are Gas Cooled Reactor? State the type of GCR and difference between them. State the advantages and disadvantages of GCR
10. Explain with neat sketch construction and working of CANDU type reactor
11. Explain with neat sketch construction and working of liquid metal cooled reactor
12. Explain Nuclear waste and its disposal
13. State the advantages of fast breeder reactor
14. Explain site selection for nuclear power plant

15. State the advantages and disadvantages of nuclear power plant
16. Explain direct cycle high temperature gas cooled reactor gas turbine power plant with neat sketch.

### **Assignment 11 Economics of power Generation**

1. Explain briefly the following: 1. Load curve 2. Load duration curve.
2. Define: Load factor, Diversity factor, and Plant use factor.
3. How is the load duration curve constructed?
4. Define the following terms :
  1. Peak wood 2. Average load 3. Plant capacity factor 4. Connected Load.
5. Discuss the effect of variation of load factor and diversity of factor on the design of a power plant.
6. Discuss the methods of meeting variable loads on power plant.
7. Explain briefly the following
  1. Capital or fixed cost
  2. Operational cost
8. Enumerate and explain briefly various Methods used to calculate the depreciation
9. What do you mean by the sinking fund Method of accumulating the money for the Depreciation fund?
10. What is the significance of incremental Rate for a power plant?
11. What is the significance of two part tariff And three part tariff
12. What do you understand by the term Tariff?

### **Assignment 12 Nozzle**

1. What are the functions of steam nozzle?
2. Describe different types of nozzles with neat sketch.
3. Derive an expression for velocity of steam at exit nozzle.
4. Define the term 'Nozzle efficiency'
5. Derive an expression for mass flow rate of steam through nozzle.
6. Starting from fundamentals, show that maximum discharge through nozzle, the ratio of throat pressure to inlet pressure is given by  $(2/n+1)^{n/n-1}$  where 'n' is the index of isentropic expansion of steam through nozzle.
7. What is critical pressure? Derive the expression of critical pressure ratio to have maximum mass flow for a nozzle, if the steam expands according to  $p v^n = C$  isentropically. Explain also its physical significance.
8. Explain physical significance of critical pressure ratio.
9. Explain general relationship between area-velocity and pressure in nozzle flow.
10. What are the effects of supersaturation on discharge and heat drop?

### **Assignment 13 Jet propulsion**

1. What is the principle of jet propulsion?
2. Write short note on Ram jet engine.
3. Write short note on Turbojet engine.
4. Draw rough sketch showing pressure, temperature, velocity distribution in turbojet engine. Explain turbojet engine with after burner.
5. Show that the propulsive efficiency of turbojet is given by  $\eta_p = 2/(1 + C_j / C_a)$  where  $C_j$  = Jet velocity,  $C_a$  = Aircraft velocity. Why propulsive efficiency in the neighbourhood of 100% is not used?
6. Explain Thrust, Thrust power, Propulsive efficiency and Thermal efficiency.
7. Explain working difference between propeller jet, turbojet and turboprop.

GATE