

B.Power Engg. 3rd Year 1st Semester Supplementary Examination, 2017**Subject : Steam Generator****Time : 3 hours****Full Marks 100****Answer any five questions**

1. (a) With the help of neat sketches discuss the differences between a tower type boiler layout and a two pass boiler layout. (10)
- (b) What are the advantages of a fluidized bed boiler? Discuss the differences between Bubbling Fluidized Bed and Circulating Fluidized Bed boilers in brief. (10)
2. (a) What are the different coal firing methods in a steam generator? Which of these firing methods is mostly adopted in power station steam generators and why? (10)
- (b) How is the unit system different from central system of pulverized coal firing? - discuss with the merits and demerits of both the systems. (10)
3. (a) Explain the differences between straight flow type and vortex type coal burners. Discuss the various burner arrangements in pulverized coal fired steam generators indicating the types of burners used in them. (10)
- (b) Describe the operating principle of a low NO_x burner. What are the other methods of NO_x control in steam generators? (10)
4. (a) What is nucleate boiling? What do you mean by DNB and when does it happen? What is the effect of DNB in a steam generator? (8)
- (b) With neat sketches discuss the various types of waterwall arrangements in a steam generator. Which of these arrangements is the most favoured in power plant steam generators and why? (8)
- (c) When does natural circulation cease to work in a steam generator? (4)
5. (a) What are the functions of a steam drum? Show the various drum internals in a neat sketch and discuss their operation. (12)
- (b) What is blow down from a steam generator? Why is it required? (8)
6. (a) What is platen superheater? Where is it located and why? (8)
- (b) When would you opt for a mixed flow type superheater tube in a steam generator? (6)
- (c) What is the significance of Furnace Exit Gas Temperature (FEGT) in the design of a steam generator? (6)
7. (a) What do you mean by superheater attemperation? Why is it done and how? (8)
- (b) Why air preheating is required in a steam generator? Explain the working principle of a regenerative air preheater. (12)
8. In a boiler trial following observation have been made:
 Ultimate analysis of moisture free coal: C – 58%, H – 3%, O – 6.2%, N – 1% and rest ash.
 The analysis of dry flue gas at the boiler exit gives CO₂ – 13.8% and CO – 1.3%.
 Free moisture in the as fired coal is 4%, carbon in refuse is 4.5% and excess air supplied is 15%.
 If the flue gas leaves at 140^o C and the ambient temperature is 30^o C, determine the dry flue gas loss per kg of coal fed. Take the specific heat of dry flue gas as 1.1 kJ/kg-K.

If the calorific value of air-dried coal is 19500 kJ/kg determine the percentage loss due to incomplete combustion and unburnt carbon. The heat of formation of CO_2 and CO are -393.8 MJ/kmol and -110.6 MJ/kmol respectively.

(20)