KUMARAGURU
college of technology
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Register Number:……….….

M.E DEGREE EXAMINATIONS: NOV/DEC 2014

(Regulation 2013)

Third Semester

ENERGY ENGINEERING

P13EETE12: Boiler Technology

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 2 = 20 Marks)

1. What factor should be taken into consideration while selecting the boiler for steam power plant?

2. Write down the four basic conditions that must be fulfilled to burn a fuel completly during combustion?

3. What are the three stages of pulverization process?

4. What is a bowl mill? What are its advantages?

5. What are the advantages of using combined gas-oil burners?

6. Write short notes tangential fired burners?

7. What are the three distinct zones of combustion in a CFB furnace?

8. Write short notes on cyclone Furnace?

9. What is the function of air preheater? How does air preheating save fuel?

10. Draw the temperature profile for economizer coil?

Answer any FIVE Questions:-

PART B (5 x 16 = 80 Marks)

Q.No:11 is Compulsory

11.   Discuss briefly on various heat losses in boiler plant and their method of determination?

12. a) Find the number and length of superheater coils of 50mm id and 5mm thickness to be   (8) provided if steam at exit is at 60 bar, 500°C and flows with a velocity of 10 m/s and mass flow rate of 80kg/s. Due to destruction by materials, the heat flux in the superheater coils is to be limited to 140 kW/m^2.

b) Discuss the different arrangements of burners in pulverized coal fired furnace?   (8)

13. a) Explain in detail about working of pulverized coal direct firing system with suitable (8)
        diagram? What are its merits and demerits?

    b) A fluidized bed combustor burns a solid fuel of high volatile matter with a calorific (8)
        value of 24 MJ/kg. the combustion conditions are such that 65% of the calorific value
        is released in the bed and the remainder in the above-bed zone from which the
        products leave at 850°C.The air inlet temperature is 30°C, the bed temperature is
        50°Cand the air fuel ratio by mass is 13.5:1. The specific heat of the products leaving
        the bed surface is 1.035 kJ/kgk. If the burning rate of coal is 7000 kg/h, estimate the
        rate of heat removal   a.) from the bed, and   b.) from the above-bed zone.

14.   Discuss different types of oil furnace? Also discuss their relative merits and demerits

15. a) Explain in detail about wet bottom furnace? Where it is used? How is slag removed (10)
        continuously?

    b) Fluidized bed is required to operate at atmospheric pressure and a bed temperature of (6)
        850 °C. The fuel has a calorific value of 25MJ/Kg. The stoichiometric fuel air ratio is
        9.5 by mass and 20% excess air is used. The total fueling rate is 4.8MW. The density
        of air at 850 °C is 0.3145 kg/m^3. Find the planform area required if (a) the firing rate
        is 2MW/m^2, and (b) the fluidizing velocity is 2.7 m/s.

16.   The following data refer to a boiler plant consisting of an economiser, a boiler and
        superheater:
        Mass of water evaporated per hour = 5940kg, mass of coal burnt per hour = 675kg.
        L.C.V. of coal=31600kJ/kg, pressure of stem at boiler stop valve=14 bar, temperature
        of feed water entering the economiser =32°C , temperature of feed water leaving the
        economiser=115°C, dryness fraction of steam leaving the boiler and entering
        superheater=0.96, temperature of dryness fraction of steam leaving the
        superheater=260°C, specific heat of superheat steam =2.3. Determine
         (1)Percentage of heat in coal utilized in economiser, boiler and superheater.
        (2) Overall efficiency of the boiler plant.

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