BACHELOR OF POWER ENGG. EXAMINATION, 2011

(4th Year, 1st Semester)

HIGH PRESSURE UTILITY BOILER

Time : Three hours   Full Marks : 100

Answer any *five* questions.

1. a) Why are supercritical units preferred for a high capacity steam power plant?   4

    b) Explain the mode of fluid circulation for supercritical boiler at different load conditions.   4

    c) Describe main features of a supercritical boiler.   6

    d) Describe stort up and operating modes of a supercritical boiler.   6

2. a) Why does quality of drum water differs from feed water for a subcritical boiler?   4

    b) Why is best quality of water is preferred for a supercritical units?   4

    c) Describe different methods of internal treatment of boiler water.   8

    d) What are the equipment used for infection of chemical in boiler water.   4

[Turn Over]

3. a) What are the selection criteria for boiler quality steels?

8

b) What materials are used for manufacture of superheater and reheater of a high capacity boiler?   4

c) Final super heates inlet header of diameter 220mm size is located in connection area of furnace. Operating presoure of heads is 170.0 Borg and temperature is 500⁰C.

Calculate minimum safe thickness with following data.

i) Design code IBR

ii) Minimum specified tensite stress at room temperature is 490 N/mm² 0.2% proof stress

AT 500⁰C   is 190 N/mm²

At 550⁰C   is 168 N/mm²

Average stress to produce nufture in 100,000 hours at temperature

530⁰C   98 N/mm²

540⁰C   84 N/mm²

iii) Drill hole position is shown in SKETCH-1

Assume corrosion allowance 0.5 mm and tube manufacturing allowance ±7.5%.   8

7.   Write a few lines on :   4x5

a) Circulating pump assioting natural circulation

b) Luminious and non luminious radiation

c) Heathy internal deposit of tube

d) Interactive chemistry Management system.

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5. a) Describe why and how different sections of economiser superheats and reheater banko are located in boiler.

   10

   b) How fluid side pressure drop is calculated? Explain. 4

   c) 198 Tons of steam is flowing through a pipe per hour. Pressure and temperature of steam is 130.43 Berg and 540⁰C. Establish pipe size assuming fluid velocity of 50 m/sec.

   Also estimate pressure droft over a length 200m. Pipe will have 8 sends of 90⁰degree angle and 2 volums at inlet and outlet ends.

   Assume friction fector 0.20 all coefficient of loss for per each bend is 0.28 and loss per value is 0.96. 6

6. a) Explain how different properties of ash affect design. Explain method of design of clean furnace with different types of coal. 10

   b) Name the equipment that is selected on the basis of volatile motter of coal. Describe how low volatile coal can be bunt successfully in boiler . 5

   c) How effect of atmospheric pollutent can be minimised?

   5
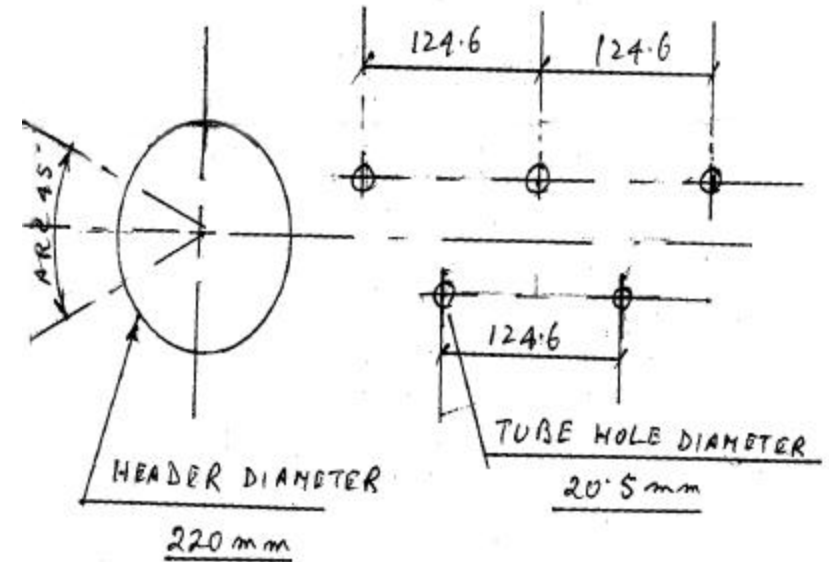
SKETCH - 1

4. a) Write thermal balance equation for furnace section of a coal fired boiler. 4

   b) Name and explain role of different heat release ratio used for design of furnace. 3

   c) What is meant by fuel entry zone of boiler? What are its essential features and also explain design criteria of this ZONE? 3

   d) Describe constructional features of different types of furnace walls. 5

   [Turn Over]