

B. POWER ENGG. FINAL EXAMINATION, 2007
(2nd Semester)

DESIGN HIGH PRESSURE BOILERS

Time : Three hours

Full Marks : 100

*Answer any **five** questions.*

1. a) Classify boiler based on use of steam. 2
b) In a high capacity boiler operating on reheat cycle, heat available for being absorbed is 525 MW. Explain as a designer how will you distribute this heat in different sections. 8
c) State important features of a high pressure high capacity boiler of our country. 10
2. a) What is natural circulation ? 2
b) Explain the factors that influence natural circulation. 8
c) State and explain principle of natural circulation with suitable diagram. 8
c) When does natural circulation cease ? 2
3. a) Explain how superheater and reheater surfaces of a large radiant boiler are located. Why such arrangements are adopted give reasons. 12

[Turn Over]

(2)

- b) What are plate elements ? Why are they so called ?
What are their special design and constructional features ? 8
4. a) What are the sources of impurities of boiler-turbine condenser system operating on closed cycle ? 5
- b) How is desired condition of drum water maintained ? 5
- c) State and explain the methods adopted for maintaining desired drum water condition. 10
5. a) What are different forms of internal and external deposits observed in boiler tubes ? 8
- b) Explain mechanism of formation of each of them. 10
- c) Explain how clean boiler condition can be maintained. 2
6. a) Explain the basic criteria of selection of material for pressure parts of boiler. 5
- b) What are alloying elements ? Explain how they improve quality of boiler steel. 5
- c) Calculate minimum thickness and required thickness of a steam outlet header with following data : 10
- Steam temperature 540°C, Pressure 184 Kg/cm²g.
Diameter 219.1 mm

(3)

Material of construction chromium Molybdenum steel having following properties :

Minimum specified tensile strength at room temperature is 490 N/mm².

Yield point stress at 500 and 550°C are 190 and 168 N/mm².

Average stress to produce rupture in 100,000 hours at temperature of 530, 540 and 550°C are 98, 84 and 72 N/mm² respectively.

Two rows of 20.5 OD tubes are connected to the header at axial pitch of 120 mm and circumferential pitch of 60 angle.

Corrosion allowance 0.8 mm.

Header manufacturing tolerance 10%.

7. Write few lines on : 4×5=20
- a) Luminous and non luminous radiation
- b) Departure from nucleate boiling
- c) Volumetric heat release of a furnace
- d) Neutral line of boiler expansion.

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