Total No. of Questions : 10]

SEAT No. :

P4005

[Total No. of Pages : 3

[4860] - 100

M.E. (Mechanical) (Design Engineering)

PROCESS EQUIPMENT DESIGN

(2008 Pattern) (Elective - II(b))

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates :

1) ***Answer any three questions from each section.***
2) ***Answers to two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Your answer will be valued as a whole.***
6) ***Use of logarithmic tables, slide rules, Mollier chart, electronic steam table and electronic pocket calculator and steam table is allowed.***
7) ***Assume suitable data, if necessary giving reasons.***

SECTION - I

Q1) a) What is intragranular corrosion and stress corrosion? Explain the ways to avoid or reduce these types of corrosion. **[6]**

b) A storage tank 6 m in diameter and 7.5 m in height has to be provided with self-supported conical roof. The slope of self-supported conical roof is 1 in 5. Roof is subjected to a superimposed load of 125 kg/m^2. Density of plate material is 8000 kg/m^3. E = 2 × 10^6 kg/cm^2. Calculate minimum thickness required for fabrication of self-supported conical roof. **[6]**

c) What are the role wind girders in open top storage tank? **[6]**

Q2) a) What are different types of "removable closures" for high pressure vessels? Explain any three of them. **[6]**

b) A tall vessel of 1.5 m in diameter and 13m in height is to be provided with skirt support. The weight of vessel with attachments is 90,000 kg. Skirt diameter is equal to diameter of vessel and height is 2.2 m. Wind pressure on the vessel is 110kg/m^3. Seismic coefficient = 0.08. Permissible stress in skirt material is 900 kg/cm^2 and permissible compressive stress is 800 kg/cm^2. Estimate thickness of support. **[10]**

P.T.O.

Q3) a) What are entrainment separators? Explain their applications. **[8]**

b) Explain with neat sketches design of self-supporting conical roof. **[8]**

Q4) a) Explain design of pressure vessel subjected to external pressure. **[6]**

b) A high pressure vessel is to be operated at 100 MN/m^2. The inside diameter of vessel is 35 cm. The steel plate with yield strength of 400 MN/m^2 is to be used for fabrication. Estimate wall thickness by maximum shear stress theory with factor of safety of 1.5. **[10]**

Q5) Write short notes on any Four : **[16]**

a) Design considerations for process equipment design.

b) Various types of roofs for storage vessels.

c) Expansion joint used in process piping systems.

d) Linings for chemical plants and equipment.

e) Design of self-supporting roof for storage vessels.

SECTION - II

Q6) a) Explain determination of shell thickness for packed distillation columns. **[6]**

b) Explain either contacting devices in plate columns or types of packing in packed columns. **[6]**

c) Explain effect of wind load and seismic load on tall vessels. **[6]**

Q7) a) Give classification of filters and explain leaf filter or rotary drum filter. **[8]**

b) Discuss in detail design of skirt support. **[8]**

Q8) a) Differentiate between batch type driers and continuous driers. **[8]**

b) Explain various safety measures considered in equipment design. **[8]**

Q9) a) With neat sketches explain construction, working and main design considerations of rotary drier. Give it's applications. **[8]**

b) Explain design consideration for shell and tube heat consideration. **[8]**

Q10) Write short notes on any Four : **[16]**

a) Vacuum Crystallizer

b) Design of saddle support

c) Types Relief valves

d) Theories of failure

e) Process flow diagrams

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