**Total No. of Questions : 10]**

**SEAT No. :** ____

**P4222**

**[Total No. of Pages : 3**

# [4960] - 100

## M.E. (Mechanical) (Design Engineering)

## PROCESS EQUIPMENT DESIGN

## (2008 Pattern)

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

***Instructions to the candidates :-***

1) ***Answer any three questions from each Section.***
2) ***Answers to the 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) Explain significance of following preliminaries in process equipment design. (any four) **[8]**

i) Design stress

ii) Weld joint efficiency

iii) Corrosion allowance

iv) Dilation of pressure vessel.

v) Factor of safety

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 Hortonspheres? **[2]**

***P.T.O.***

***Q2)*** a) What is intragranular corrosion and stress corrosion? Explain the ways to avoid or reduce these types of corrosion. **[4]**

b) Explain the method for calculating thickness of torispherical head subjected to i. internal and external pressure. **[8]**

c) List the theories of failure and explain any one of them. **[4]**

***Q3)*** a) Explain skirt supports and design aspect related t them. **[8]**

b) What are entrainment separators? Explain their applications. **[4]**

c) What is gasket factor? Explain gasket selection and classification. **[4]**

***Q4)*** a) A pressure vessel is to be designed for an internal pressure of $0.6N/mm^2$. The vessel has nominal diameter of 1.2 m. The material used for vessel has permissible stress of $120N/mm^2$. If the weight of vessel and its content is 3000kg and torque due to offset piping is 450 N.m. . Find stresses due to combined loading. **[10]**

b) Explain reinforcement of nozzles. **[6]**

***Q5)*** Write short notes on any three. **[18]**

a) Expansion joint used in process piping systems.

b) Floating roof type storage tank.

c) Design of saddle support.

d) Protective coatings and their applications.

## SECTION -II

***Q6)*** a) Explain design considerations for shell and tube heat exchanger. **[8]**

b) Differentiate between vacuum filters and centrifugal filters. Explain either rotary disc filter or leaf filter. **[8]**

***Q7)*** a) What are the types of baffles used in heat exchanger? **[4]**

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

c) What is an entrainment separator. **[2]**

d) What types of loses are possible in storage of volatile liquids. **[4]**

***Q8)*** a) Explain important features of packed or plate columns. **[8]**

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

***Q9)*** a) Explain determination of power requirements of agitator. **[4]**

b) Give classification of vacuum pumps or explain any one metering pump. **[6]**

c) What are integral, fabricated and formed nozzles. **[6]**

***Q10)*** Write short note on any three of following **[18]**

a) Types of agitators

b) Vacuum Crystallizer

c) Inspection of pressure vessels

d) Process flow diagrams