Eighth Semester B.Tech Degree Examination, May 2016

Model Question

13.802 Chemical Engineering Design II (H)

(Open Book Examination)

Time: 3 Hours   Maximum Marks: 100

Instructions :

I.   *The following text books or attested copies of the books may be permitted in the examination hall. Apart from this, attested copy of Moody charts and other charts/plots required for design of equipments may also be permitted in the exam hall. The copy of the relevant pages of the text book containing the empirical equations and other monographs duly attested by the faculty member applicable for design may also be permitted in the examination hall.*

   1. Steam tables and Psychometric Charts

   2. Process Engineer's Equipment Design by M.V. Joshi, McMillan and Co., India, Delhi

   3. Perry's Hand Book of Chemical Engineering, McGraw Hill (Relevant Editions)

   4. Introduction to Chemical Equipment Design- Mechanical Aspects by B.C. Bhattacharya

   5. IS Code for Unfired Pressure Vessels IS 4503, BIS, New Delhi, 1969.

II.   *Any missing data may be assumed suitably.*
III. *Answer **any one** question. Each question carries 100 marks*

Questions:

1. a. Design a shell and tube heat exchanger to cool 75000 kg/h of ethylene glycol from 120^0C to 105^0C using water as coolant. Water gets heated up from 25^0C to 60^0C during the process. (90 Marks)

b. Give a representative sketch of the shell and tube heat exchanger designed in Question 1, part a. (10 Marks)

2. a. A methanol water solution containing 50% of methanol is to be continuously rectified at 1 standard atmospheric pressure at a rate of 5000 kg/hr to provide a distillate containing 95% methanol and a residue containing 1% methanol. All the compositions given are in weight percent. The distillate is to be totally condensed to a liquid and the reflux returned at the bubble point. The withdrawn distillate will be separately cooled before storage. A reflux ratio of 1.5 times the minimum will be used. The feed enters the column at its boiling point. Design a bubble tray column specifying the diameter of the column, plate spacing, height of the column, percent flood. Data: Total pressure drop across the plate = 62.5mm

Weir Height = 68.75mm

Crest over weir = 7.5mm

Liquid gradient across the plate = 5mm

Pressure drop through the downcomer = 0.7mm (90 Marks)

 b. Give a representative sketch of the distillation column designed in

    Question 2, part a. (10 Marks)