B. Tech.

(SEM. VIII) EXAMINATION. 2006-07

PROCESS EQUIPMENT DESIGN

Time : 3 Hours] [Total Marks : 100

Note : (1) Attempt all questions.
       (2) All questions carry equal marks.

1 Attempt any two parts of the following : 10×2=20
   (a) Explain importance of unit operation during designing of process equipment.
   (b) Explain the factors on which equipment reliability depends.
   (c) Explain the stages of design procedure.

2 Attempt any two parts of the following : 10×2=20
   (a) Write the important mechanical properties of a material commonly used in the construction of process equipments.
   (b) Explain the main factors involved during selection of material for process-equipments.
   (c) Explain the importance of design variable to achieve the best design.
3 Attempt any **two** parts of the following : \[ 10 \times 2 = 20 \]

(a) Write the procedure for computation of tension in belt conveyor.

(b) Explain design procedure for thermal design of shell and tube heat exchanger.

(c) Determine the standard plate thickness of a process vessel cylindrical wall made of grade 2B quality steel of IS code which have allowable stress of 120 N/mm² at working temperature with joint efficiency of 0.85 and working internal pressure of 0.476 n/mm². If diameter is 1250 mm and length 250 mm what maximum internal pressure a spherical vessel can take safety, if it is made of the same material and diameter.

4 Attempt any **two** parts of the following : \[ 10 \times 2 = 20 \]

(a) Explain the analytical method of optimization.

(b) Explain the steps involved in optimization.

(c) An oil extraction unit requires to store 200 t raw oil to be filtered having the design of 0.920 kg/m³. Determine the dimension of rectangular tank in order to have the minimum sheet required for fabrication having the following, objective and constrains functions respectively.
(d) \( u(LBH) - 2LB + 2BH + HL \)

(e) \( v(LBH) = LBH - V \)

Where \( LBH \), and \( V \) is length breadth, height and volume of the required tank respectively.

5 Attempt any two parts of the following: \( 10 \times 2 = 20 \)

(a) What is PERT? Explain its importance in optimization.

(b) Explain the techniques involved in design optimization by computer application.

(c) Explain the importance of computer application in design of agricultural machinery.