Reg. No:…………………………..
Name:…..………………………..

Second Semester M.Tech Degree Examination,Sep 2014

(2013 scheme)

Machine Design

MDE 2003: DESIGN OF PRESSURE VESSELS AND PIPING

(MODEL QUESTION PAPER)

Time : 3 Hours   Max Marks : 60

Instructions:

*1) Answer**any two**(full) questions from each Module,all questions carry equal marks.*

2) Use of Pressure Vessels design data sheet is permitted.

Module I

1. Obtain the expression for stresses in a cylindrical vessel under internal pressure based on general membrane stress theory.

2. Determine the stresses at the hemispherical head–cylindrical joint of a vessel for the conditions of; radius 1300mm, internal pressure 2 MPa, thickness for both head and vessel is same and is 25mm, Poisson's ratio 0.3 ; and sketch the stress variation near the joint in the cylindrical portion.

3. Write a note on the ASME code equations for various closure headsused in a pressure vessel.

Module II

4. Explain different types of pressure vessel supports with suitable sketches.

5. Write a note on the development of pressure vessel construction codes

6. Examine the data given below of a fully radiographed shell to check the compensation requirement. Outside diameter (OD) of shell 2m, maximum working pressure 3.5MPa, wall thickness of shell 0.05 m, corrosion allowance 0.003m, allowable stress 96 MPa, OD of nozzle 0.25m, nozzle wall thickness 0.016m, length of nozzle above surface 0.1m. No extension inside.

Module III

7. (a) Explain the elastic buckling of long cylinders under external pressure. Calculate the collapse pressure and critical stress for a long steel pipe with 400 NB, 8 mm thickness (schedule 20). E = 210 GPa (3)

(b) A 150mm NB pipe has an external design pressure of 30 bar at 400^0 C. The material of construction of pipe is ASTM A312 stainless steel. The corrosion allowance is nil and mill tolerance allowance is 12.5%. Based on ASME design criteria, checkwhether selection of schedule 5 standard pipe is correct?, if not select proper schedule. Assume a factor of safety 3. (7)

Data given from pipe thickness chart:

NB	OD	Sch 5S	Sch10S	Sch 40S	Sch 80	Sch 120
150	168.27	2.77	3.40	7.11	10.97	14.27

7. A pipe with a 48 inch inside diameter and a 60 inch outside diameter is subjected to an internal pressure of 35MPa Determine the value and place of occurrence of (a) the maximum tangential stress (b) the maximum radial stress (c) the maximum shear stress (d) the average tangential stress (e) What percent is this of the maximum tangential stress

9. Write a note on different piping elements/components in a piping system.