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SF-7853

B. E. - IV (Sem. VIII) (Mechanical) Examination

May / June - 2011

Design of Pressure Vessel & Piping

(Elective - II)

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. - 4 (SEM. 8) (MECHANICAL)**

Name of the Subject :

☛ **DESIGN OF PRESSURE VESSEL & PIPING**

☛ Subject Code No. : **7 8 5 3** ☛ Section No. (1, 2,.....) : **NIL**

Seat No. :

Student's Signature

(2) Q.1 and Q.5 is compulsory and attempt any two questions out of Q.2, Q.3, Q.4 and also attempt any two questions out of Q.6, Q.7, Q.8.

(3) Figures to the right indicate full marks.

(4) Use of design data book is permitted.

(5) Assume suitable data if required.

1 (a) Answer the following : **10**

(i) What is out of roundness of shell ?

(ii) Give classification of pressure vessel.

(iii) List the material used in construction of pressure vessel.

(iv) Why stiffening rings are provided to the vessel ?

(v) Give various condition when skirt may fail.

(b) (1) Explain various method for construction of Head. **4**

(2) Explain purging of vessels. **4**

2 A vessel having cylindrical shell and hemispherical head as an end closure design the vessel for internal pressure and check against external pressure. **16**

- Internal pressure = 8.69 N/mm^2
- Allowable stress at 830 ^oF = 152.24 N/mm^2
- Weld Joint efficiency = 1
- Inside diameter of shell (corroded) = 4115 mm
- Corrosion allowance for shell 2 = 9.52 mm Head
- Inside radius of Head (corroded) = 2057.5 mm
- External pressure = 0.10 N/mm^2
- Length of entire shell = 15291 mm

3 (a) Check the conical head section thickness 0.375 inch is satisfactory for the following data external design pressure = 15 PSI, Material of the cone 5A 285-C and 500°F design temperature (see figure 1). 8

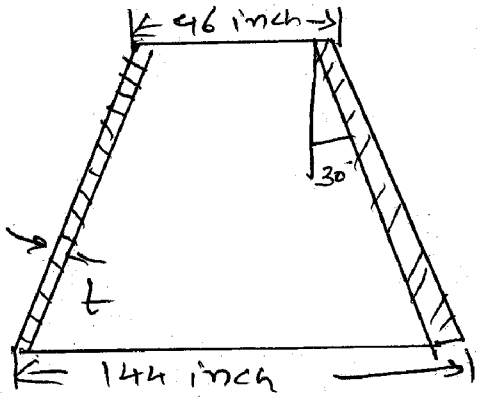

Fig. 1

(b) Explain minor energy loss. 8

4 A shrink fit assembly, formed by shrinking one tube over another, is subjected to an internal pressure of 60 N/mm^2 before the fluid is admitted, the internal and the external diameters of the assembly are 120 mm and 200 mm and the diameter at the junction is 160 mm. If after shrinking on the contain pressure at the junction is 8 N/mm^2, determine using lane and equations, the stresses at the inner, mating and outer surface of the assembly after the fluid has been admitted. **16**

5 (a) Answer the following : **10**

(i) Define the primary and secondary stresses.

(ii) What is Auto Freetase ?

(iii) Explain major losses.

(iv) Explain Hydraulic gradient line.

(v) What is membrane stress ?

(b) Derive the expression for the principal stresses of thick cylinder subjected to only Internal Pressure. 8

6 For the following design data do the calculation for reinforcement. **16**

- Inside diameter of shell = 7700 mm
- Internal design pressure = 0.517 N/mm^2
- Allowable stress for shell = 103.425 N/mm^2
- Allowable stress for Nozzle = 95.15 N/mm^2
- Shell thickness = 60 mm
- Nozzle thickness = 40 mm
- Nozzle inside diameter = 900 mm
- Fillet weld = 9mm
- Extension of Nozzle inside = 27.432 mm

7 (a) Explain optimum proportions of a vessel and derive equation. 8

(b) Explain optimum vessel size and derive the equation. 8

8 Design a flange for the following data. **16**

- Operating pressure = 7.79 N/mm^2
- Gasket Spiral wound, stainless
- Stress intensity for flange = 172.38 N/mm^2 at atmospheric temperature.
- Stress intensity for flange at operating temperature = 152.24 N/mm^2 at operating temperature
- No. of bolts = 20

A	K_1	E	f	R	d_1	C	N	B	God	h
704.85	406.4	508	89	469.9	41.275	615.95	22.225	381	457.2	127

All dimensions are in mm.