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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
SECOND SEMESTER M.TECH DEGREE EXAMINATION, APRIL/MAY 2018
Branch : MECHANICAL ENGINEERING

Stream : MACHINE DESIGN

01ME6104 : DESIGN OF PRESSURE VESSELS AND PIPING

Answer any two full questions from each part.

Limit answers to the required points.

Use of Design Data Hand Book and ASME/IS Codes permitted.

Max. Marks: 60

Duration: 3 hours

PART A

1. a. What are the types of stresses acting on pressure vessels? (2)
b. What are the factors to be considered for the design of high pressure monobloc vessels? (3)
c. Obtain the expression for hoop's stress in a circular ring with uniformly distributed radial forces. (4)
2. a. Write the causes and consequences of discontinuity stresses in pressure vessels? (4)
b. Determine the discontinuity stresses in the vessels at a distance $\beta_x = \pi/4$ from the juncture of hemispherical head and cylindrical shell for the conditions $p=2\text{MN/m}^2$ $r=1000\text{mm}$; $t=20\text{mm}$; $\mu=0.3$. (5)
3. a. A shrink fit assembly formed by shrinking one tube over another is subjected to an internal pressure of 60N/mm^2 . Before the fluid is admitted, the internal and external diameters of the assembly are 120mm and 200mm and the diameter at the junction is 160mm . If after shrinking on the contact pressure at the junction is 8N/mm^2 , determine using Lamé's equations the stresses at the inner, meeting and outer surfaces of the assembly after the fluid has been admitted. Plot the variation of stresses. (9)

PART B

4. Explain the procedure of designing a tall cylindrical self supporting vessel as per IS:2825-1969 code. (9)

5. a. Discuss the variation of stress concentration about a circle and an elliptical hole in a plate under tension. (4)
- b. Write a short note with sketches on the ASME code equations for various closure heads used in a pressure vessel. (5)
6. a. Explain the different types of pressure vessel supports with suitable sketches. (5)
- b. Write a note on the development of pressure vessel construction codes. (4)

PART C

7. a. Discuss the phenomenon of elastic buckling of cylinders under external pressure. (6)
- b. Bring out the effect of supports on elastic buckling of cylinders. (6)
8. a. Derive the critical buckling or collapsing pressure for a circular ring under buckling with external pressure. (8)
- b. Explain the term inelastic collapse and define the various terms used. (4)
9. a. Briefly discuss the methods to increase the flexibility in a piping system. (4)
- b. What are the different stresses developed in pipes and how is it analyzed? (4)
- c. A seamless pipe carries 2400m^3 of steam per hour at a pressure of 1.4N/mm^2 . The velocity of flow is 30m/s . Assuming the tensile stress as 40MPa , find the inside diameter of the pipe and its wall thickness. (4)