MSD

Unit 4 Design of Cylinders and Pressure Vessels.

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| Sr. No | Questions |
| 1. | Internal pressure of 2.5 Mpa acts on a pressure vessel of thickness 15 mm and internal diameter of 1500 mm. What is the stress induced in longitudinal direction?  a. 36.63 N/mm2  b. 59.13 N/mm2  c. 65.62 N/mm2  d. 131.25 N/mm |
| Ans | c. 65.62 N/mm2 |
| 2. | Which type of formed threads are used for vertical pressure vessels in the pressure range of 0.1 N/mm2 to 1.5 N/mm2?  a. Plain formed head b. Torispherical dished head c. Semi-elliptical dished head d. All of the above |
| Ans | **b. Torispherical dished head** |
| 3 | Design pressure for unfired pressure vessels is 1.05 times of \_\_\_\_\_\_\_  a. minimum working pressure b. maximum working pressure c. hydrostatic test pressure d. none of the above |
| Ans | **b. maximum working pressure** |
| 4 | Class 3 pressure vessels having welded joints are \_\_\_\_\_\_\_\_\_  a. fully radio-graphed b. partially radio-graphed c. spot radio-graphed d. not radio-graphed |
| Ans | **d. not radio-graphed** |
| 5 | Which type of welded joints are not included in class 3 pressure vessels?  a. Double welded butt joint with full penetration b. Single welded but joint with back strip c. Single full fillet lap joints d. None of the above |
| Ans | **c. Single full fillet lap joints** |
| 6 | In unfired pressure vessels, category A consists of \_\_\_\_\_\_\_\_\_  a. joints connecting flanges and flat heads b. welded joints connecting nozzles with main shell c. circumferential welded joints joints d. longitudinal welded joints |
| Ans | **d. longitudinal welded joints** |
| 7 | What is the weld joint efficiency if pressure vessel is fabricated with single full fillet lap joint?  a. 1.0 b. 0.55 c. 0.65 d. 0.85 |
| Ans | **b. 0.55** |
| 8 | A cylindrical pressure vessel is subjected to an internal pressure of 3 MPa on internal diameter of 1000 mm. The vessel is fabricated with single weld butt joint with back strip and is not radio-graphed. What is the thickness of flat head, if head made of alloy steel has an ultimate tensile strength of 400 N/mm2 ? (corrosion allowance = 2)  a. 110 mm b. 120 mm c. 150.23 mm d. 152.13 mm |
| Ans | 1. **110 mm** |
| 9 | A cylindrical pressure vessel is subjected to operating pressure of 0.55 Mpa and corrosion allowance of 2. What is the thickness of pressure vessel shell if its internal diameter is 2000 mm? (σall = 120 N/mm2 & ηl = 0.75)  a. 6.5 mm b. 7 mm c. 9 mm d. 9.5 mm |
| Ans | **c.9 mm** |
| 10 | A vessel is said to be thin if   1. Its wall has less thickness 2. Stresses are uniform over the entire thickness 3. Stresses  vary at inner and at outer radius 4. None of the above |
| Ans | 1. Stresses are uniform over the entire thickness |
| 11 | In a thin vessel, the true ratio of D/t is   1. D/t =20 2. D/t=10 3. D/t >20 4. D/t >10 |
| Ans | 1. D/t >20 |
| 12 | Hoop stress in a thin vessel is   1. pD/2t 2. pD/4t 3. pD/3t 4. None |
| Ans | 1. pD/2t |
| 13 | Radial stress in a thin shell is given by  a. pD/2t  b. pD/4t  c. pD/3t  d. None |
| Ans | d. None |
| 14 | A thin cylindrical shell under internal pressure can fail by  a. Shear  b. Compression  c. Tension  d. None |
| Ans | 1. Tension |
| 15 | Failure of a thin spherical shell under internal pressure will be due to   1. Maximum shear stress 2. Principal compressive stress 3. Principal tensile stress 4. None |
| Ans | C. Principal tensile stress |
| 16 | Stresses in a thin cylindrical shell under internal pressure is independent of   1. Diameter 2. Thickness 3. Length 4. Diameter and thickness |
| Ans | 1. Length |
| 17 | Design of a thin shell under pressure is done on the basis of   1. Radial stress 2. Longitudinal stress 3. Hoop stress 4. All the three stresses |
| Ans | c. Hoop stress |
| 18 | The thickness of thin cylinder is determined on the basis of  (a) radial stress  (b) longitudinal stress  (c) circumferential stress  (d) principal shear stress |
| Ans | (c) circumferential stress |
| 19 | The end-closure for tankers of milk, petrol or diesel is  (a) hemispherical head  (b) conical head  (c) torispherical head  (d) flat head |
| Ans | (c) torispherical head |
| 20 | Weld joint efficiency is maximum when the pressure vessel is welded by (a) single-welded butt joint with backing strip (b) single-welded butt joint without backing strip (c) double-welded butt joint with full penetration (d) none of the above |
| Ans | (c) double-welded butt joint with full penetration |
| 21 | While designing pressure vessels according to ‘Code for unfired vessel IS2825’, the design pressure is taken as  (a) 1.05(maximum operating pressure)  (b) 1.5(maximum operating pressure)  (c) 2(maximum operating pressure)  (d) 1.3(maximum operating pressure) |
| Ans | (a) 1.05(maximum operating pressure) |
| 22 | Class 3 pressure vessels are to be designed according to ‘Code for unfired vessel IS-2825’ when,  (a) operating pressure is less than 17.5 kgf/cm2  (b) operating temperature is more than 0°C and less than 250°C  (c) thickness of shell is less than 16 mm  (d) any one of the above |
| Ans | (d) any one of the above |
| 23 | Class 1 pressure vessels are to be designed according to ‘Code for unfired vessel IS-2825’ when,  a. hydrocyanic acid, carbonyl chloride or mustard gas are stored  b. operating temperature is more than -20°C  c. liquefied petroleum gas is stored  d. thickness of shell is less than 38 mm |
| Ans | a. hydrocyanic acid, carbonyl chloride or mustard gas are stored |
| 24 | According to Lame’s equation, the thickness of cylindrical shell is given by, |
| Ans |  |
| 25 | According to Birnie’s equation, the thickness of cylindrical shell is given by, |
| Ans |  |
| 26 | According to Clavarino’s equation, the thickness of cylindrical shell is given by, |
| Ans |  |
| 27 | In thick cylinders, the tangential stress across the thickness of cylinder  (a) remains uniform throughout  (b) varies from internal pressure at the inner surface to zero at the outer surface (c) varies from maximum value at the inner surface to minimum value at the outer surface  (d) varies from maximum value at the outer surface to minimum value at the inner surface |
| Ans | (c) varies from maximum value at the inner surface to minimum value at the outer surface |
| 28 | In thick cylinders, the radial stress across the thickness of cylinder (a) remains uniform throughout (b) varies from internal pressure at the inner surface to zero at the outer surface (c) varies from maximum value at the inner surface to minimum value at the outer surface (d) varies from maximum value at the outer surface to minimum value at the inner surface |
| Ans | (b) varies from internal pressure at the inner surface to zero at the outer surface |
| 29 | In thick cylinders, the axial stress across the thickness of cylinder  (a) remains uniform throughout  (b) varies from internal pressure at the inner surface to zero at the outer surface (c) varies from maximum value at the inner surface to minimum value at the outer surface  (d) varies from maximum value at the outer surface to minimum value at the inner surface |
| Ans | (a) remains uniform throughout |
| 30 | Autofrettage is,  (a) a surface coating process of cylinders for corrosion resistance  (b) a heat treatment process for cylinders to relieve residual stresses  (c) a process of pre-stressing the cylinder to develop residual compressive stress at the inner surface  (d) a surface hardening process of cylinder to improve wear resistance 22 |
| Ans | (c) a process of pre-stressing the cylinder to develop residual compressive stress at the inner surface |
| 31 | Autofrettage is achieved by,  (a) compound cylinder  (b) overloading the cylinder before putting it in service  (c) winding a wire under tension around the cylinder  (d) any one of the above methods |
| Ans | (d) any one of the above methods |
| 32 | The thickness of thick cylindrical shell with closed ends and made of brittle material is determined by,  (a) Lame’s equation  (b) Clavarino’s equation  (c) Birnie’s equation  (d) Barlow’s equation |
| Ans | (a) Lame’s equation |
| 33 | The thickness of thick cylindrical shell with closed ends and made of ductile material is determined by,  (a) Lame’s equation  (b) Clavarino’s equation  (c) Birnie’s equation  (d) Barlow’s equation |
| Ans | (b) Clavarino’s equation |
| 34 | The thickness of thick cylindrical shell with open ends and made of ductile material is determined by,  (a) Lame’s equation  (b) Clavarino’s equation  (c) Birnie’s equation  (d) Barlow’s equation |
| Ans | (c) Birnie’s equation |
| 35 | In thin cylinders, the longitudinal stress is,  (a) 2(circumferential stress)  (b) 1/2(circumferential stress)  (c) 1/4(circumferential stress)  (d) 4(circumferential stress) |
| Ans | (b) 1/2(circumferential stress) |
| 36 | The thickness of thin cylinder is determined on the basis of,  (a) radial stress  (b) longitudinal stress  (c) circumferential stress  (d) principal shear stress |
| Ans | (c) circumferential stress |
| 37 | The piston rod of a hydraulic cylinder exerts an operating force of 10kN. The allowable stress in the cylinder is 45N/mm². Calculate the thickness of the cylinder using Lame’s equation. Diameter of the cylinder is 40mm and pressure in cylinder is 10MPa. a) 2.05mm b) 4.2mm c) 5.07mm d) None of the listed |
| Ans | c) 5.07mm  t=D/2[√[σ+ P /σ-P] -1 ]. |
| 38 | The piston rod of a hydraulic cylinder exerts an operating force of 10kN. The allowable stress in the cylinder is 70N/mm². Calculate the thickness of the cylinder using Clavarinoe’s equation. Diameter of the cylinder is 240mm.μ=0.3 and pressure in cylinder is 15MPa. a) 35mm b) 30mm c) 27mm d) None of the listed |
| Ans | c) 27mm  t=D/2[√[σ+(1-2μ) P /σ-(1+μ)P] -1 ]. |
| 39 | A seamless cylinder of storage capacity of 0.03mᵌis subjected to an internal pressure of 21MPa. The ultimate strength of material of cylinder is 350N/mm².Determine the thickness of the cylinder if it is twice the diameter of the cylinder. a) 12mm b) 4mm c) 8mm d) 16mm |
| Ans | c) 8mm  t=PD/2σ. |
| 40 | A seamless cylinder of storage capacity of 0.03mᵌis subjected to an internal pressure of 21MPa. The ultimate strength of material of cylinder is 350N/mm².Determine the length of the cylinder if it is twice the diameter of the cylinder.  a) 540mm  b) 270mm  c) 400mm  d) 350mm |
| Ans | a) 540mm  0.03=πd²L/4 and L=2d. |
| 41 | A thin cylindrical pressure vessel with closed-ends is subjected to internal pressure. The ratio of circumferential (hoop) stress to the longitudinal stress is  a)0.25  b)0.50  c)1.0  d)2.0 |
| Ans | d)2.0 |
| 42 | What is the condition to avoid joint separation of connected members in cylinders.   * 1. Fm<0   2. Fm>0   3. Fm=0   4. None of the above |
| Ans | * 1. Fm<0 |
| 43 | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_closure is the weakest enclosure for cylindrical vessels.  a.)Hemispherical  b) Torispherical  c) Conical or flat plate  d) Elliptical |
| Ans | c) Conical or flat plate |
| 44 | In hydrostatic testing of welded pipe (for leakage, strength etc.) the ratio of minimum hydrostatic test pressure to internal design pressure is around  a. 0.5  b. 1.5  c. 2.5  d. 3.5 |
| Ans | b.1.5 |
| 45 | A certain pressure vessel manufacturer avoids doing reinforcements calculations for openings by always providing a reinforcing pad extending upto double the diameter of the opening and of the same material and thickness as that of the shell wall. If area compensation is accepted as a code guideline, his approach leads to safe design  a. Only if the opening is on spherical vessel  b. Only if the opening is on a vertical cylindrical vessel  c. Only if the opening is on a horizontal cylindrical vessel  d. Irrespective of the shape of the vessel |
| Ans | d. Irrespective of the shape of the vessel |
| 46 | Safety valves are provided in chemical equipments to guard against excessive  a. Temperature  b. Pressure/pressure fluctuation  c. Turbulence  d. Noise |
| Ans | b. Pressure/pressure fluctuation |
| 47 | Welded joint efficiency in the design of chemical process equipment is taken as  a. 0.55  b. 0.75  c. 0.85  d. 0.95 |
| Ans | c. 0.85 |
| 48 | Circumferential (hoop) stress in a thin cylindrical vessel under internal pressure is \_\_\_\_\_\_\_\_\_\_ the longitudinal stress.  a. Half  b. Equal to  c. Twice  d. Eight times |
| Ans | c. Twice |
| 49 | Cylindrical pressure vessels in horizontal condition is generally supported on a \_\_\_\_\_\_\_\_\_\_ support.  a. Lug  b. Skirt  c. Saddle  d. Guy wire |
| Ans | c. Saddle |
| 50 | For high pressure process equipments/vessels, the connected nozzle should be  a. Welded  b. Screwed  c. Flanged  d. Brazed |
| Ans | c. Flanged |