LAXMINARAYAN INSTITUTE OF TECHNOLOGY

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6th SEMESTER B.TECH CHEMICAL ENGINEERING

SUBJECT: PROCESS EQUIPMENT DESIGN

QUESTION BANK

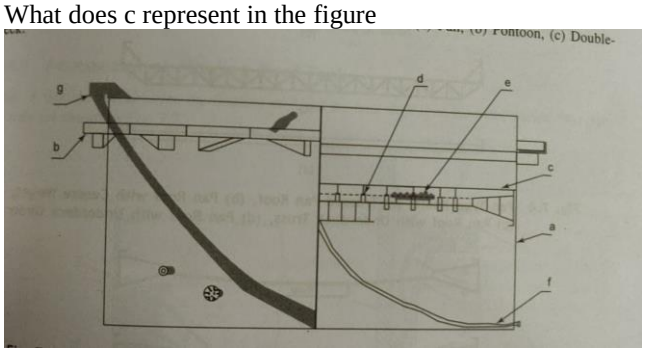
1. _____ closure is the weakest enclosure for cylindrical vessels.
   A. Hemispherical
   B. Torispherical
   C. Conical or flat plate
   D. Elliptical
2. A stuffing box is used for
   A. absorbing the contraction/expansion of pipeline due to temperature changes.
   B. prevention of fluid leakage around moving parts.
   C. facilitating smooth opening and closing of a valve.
   D. reducing the resistance of fluid flow.
3. In spherical shell, the longitudinal stress is _____ circumferential stress
   A. Equal to
   B. Smaller than
   C. Greater than
   D. None of these
4. Where does the maximum tensile strength occur in a thick cylindrical vessel subjected to internal pressure ?
   A. None of these.
   B. At the mid thickness of the cylindrical wall.
   C. At the inner surface.
   D. At the outer surface.
5. Which of the following isn't an internal design constraint
   A. Safety
   B. Process/ Method
   C. Operating conditions
   D. Time
6. ASTM stands for
   A. All Indian Standard for Testing materials
   B. American Society for Testing materials
   C. African standard of testing materials
   D. All countries standard of testing materials
7. Clingage loss is a process in which
   A. Liquid vapors are expelled from the free space which is in contact with free surface
   B. Vapor pressure equals or exceeds the atmospheric pressure
   C. Liquid tends to flow upwards between two closely spaced surfaces
   D. Liquid tries to adhere to wall surface once in contact with it
8. The flowrate of solids from bin outlet is not a function of
   A. Bulk density
   B. Particle shape
   C. Moisture content
   D. Viscosity
9. The stress due to weight of the vessel is always
   A. Tensile
   B. Compressive
   C. Elongative
   D. Radial
10. Layered vessel construction can be divided into
   A. Concentric wrapped method
   B. Shrink fit method
   C. Coil wrapped method
   D. All of these

11. According to which theory does the failure occur when maximum shear stress is equal to shear stress at elastic limit
    A. Maximum principal stress
    B. Maximum Shear stress theory
    C. Maximum strain energy theory
    D. None of these
12. The axial stress f for spherical shell of a pressure vessel is given by
    A. f=PD/2t
    B. f=PD/4t
    C. f=PD/2tJ
    D. f=PD/t
13. In chemical process equipment, the conical bottom heads used, usually has an apex angle (in degree) of
    A. 20
    B. 40.
    C. 60
    D. 80
14. The ends of a cylinderical vessel can be closed by a head, which can be one of the four shapes. For the same thickness, choose the one which can withstand the highest pressure.
    A. Flat plate
    B. Hemispherical
    C. Torispherical
    D. Ellipsoidal
15. For calculating optimum vessel size which is true
    A. dV/dD = 0
    B. V×D = 0
    C. d^2V/dD^2 = Constant
    D. dA/dD = Constant
16. In autofrettage construction,
    A. inner part of shell is elastic
    B. Outer part of shell is elastic
    C. Inner and outer part is elastic
    D. Inner and outer part is plastic
17. Which are the following stress is caused due to torque acting on vessel
    A. Wind load
    B. Load due to inlet, outlet of process fluid
    C. Internal pressure
    D. Weight of vessel
18. On the basis of strain energy theory, the equivalent stress induced in the vessel is given by given fl longitudinal stress ft circumferential stress fs stress due to torque
    A. $f_r = [f_t^2 - f_t f_l + f_l^2 + 3f_s^2]^{1/2}$
    B. $f_r = [f_t^2 + f_t f_l + f_l^2 + 3f_s^2]^{1/2}$
    C. $f_r = [f_t^2 - f_t f_l + f_l^2 - 3f_s^2]^{1/2}$
    D. $f_r = [f_t^2 - f_t f_l - f_l^2 + 3f_s^2]^{1/2}$
19. Area for area method is used to calculate
    A. Thickness of shell
    B. Thickness of Nozzle
    C. Thickness of Nozzle reinforcement
    D. Thickness of head
20. Which of the following is non standard flange
    A. Ring flange
    B. Welded neck flange
    C. Hub type flange
    D. Angle ring flange
21. Calculate the thickness of shell (in mm) subjected to pressure of 0.3 N/mm2 having 1200mm as outside diameter. Don't assume any corrosion allowance
    A. 17.9
    B. 1.79
    C. 2.5
    D. 25
22. Calculate the load on operating conditions (in N) for a flange of nominal diameter 1200mm, inside diameter of flange is 1202mm outside diameter of flange is 1315 mm, thickness of flange is 45mm subjected to internal

pressure of 0.3 N/mm2 with minimum gasket seating stress of 11.2 N/mm2. Outside diameter of stainless steel lining ring is 1240 mm

A. 425733.4
B. 412586.6
C. 524158.5
D. 421262.8

23. To make a more economical selection of material following thing is done
    A. Thickwall construction
    B. Autofrettage construction
    C. Prestressing
    D. Shrink fit construction
24. What does c represent in the figure



    A. Shell
    B. Hose drain or swivel Joint
    C. Adjustable pipe support
    D. Pontoon type floating roof

ANSWER: C

25. The kind of vessel support mostly favored by tall pressure vessels is
    A. Skirt Support
    B. Saddle support
    C. Bracket Support
    D. Leg support

ANSWER: A

26. Stress due to seismic bending moment is given by
    A. $f_{sb} = \frac{M_{sb}}{2\pi {D_o}^2 t_{sk}}$
    B. $f_{sb} = \frac{8M_{sb}}{\pi {D_o}^2 t_{sk}}$
    C. $f_{sb} = \frac{4M_{sb}}{\pi {D_o}^2 t_{sk}}$
    D. $f_{sb} = \frac{4M_{sb}}{16\pi {D_o}^2 t_{sk}}$

ANSWER: C

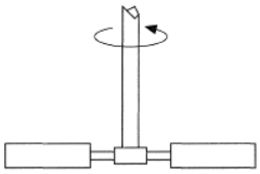
27. A tall vertical vessel 2.2 m outside diameter and 34 m height has shell thickness of 14mm. The wind force acting on the vessel is 128kg/sq. m and weight of vessel is 91000kg. Calculate the bending moment induced in the vessel in kg m
    A. 122221.8
    B. 12221.8
    C. 1222221.8
    D. 1221.8
28. Estimate the period of vibration for a tall vertical vessel 2.5m diameter and 40 m height. The thickness of shell is 12 mm.The weight of vessel is 1250kg /m
    A. 82sec
    B. 8.2 sec
    C. 0.82 sec
    D. 0.082 sec
29. Which of the following is not a conventional gasket
    A. Flat ring gasket
    B. Corrugated metal asbestos filled gasket
    C. Solid metal octagonal gasket

D. O ring Gasket

30. Nozzle reinforcement
    A. reduces stress concentration
    B. increases the thickness of nozzle
    C. increases thickness of shell
    D. none of these
31. Process of liquid vapors being expelled from the free space which is in contact with liquid surface is called as
    A. Breathing loss
    B. Convection loss
    C. Wicking
    D. Filling
32. While optimizing proportions of a storage tank with respect to cost incurred (C- cost, D- diameter, V- Volume, H- height)
    A. dC/dD=0
    B. dC/dt=0
    C. C.V=0
    D. C.H=0
33. Which of the following is a floating type roof
    A. Pontoon roof
    B. Double decked roof
    C. Pan roof
    D. All of these
34. A pressure vessel is required to have a capacity of 20 cu m With an operating pressure of 6kg/sq cm the allowable stress is 1090kg/sqcm Estimate optimum diameter and length of vessel assume J to be equal to 85% and corrosion allowance of 2 mm
    A. L=9.13 m D=1.67 m
    B. L=10.25 m D=3.2m
    C. L=7.38 m D= 0.6 m
    D. None of these
35. A vessel having 1.6 m diameter operates at 5 kg/sq cm. the permissible stress is 1020kg/sq cm. Which standard plate would you prefer to use assuming joint efficiency of 85%
    A. 6mm
    B. 3mm
    C. 10 mm
    D. 15 mm
36. Which amongst the following is not an advantage for lug support
    A. Less cost
    B. Easy levelled
    C. Can be attached at minimum weld length
    D. Brackets are eccentric
37. A cylinder is considered as thin cylinder when the ratio of inner diameter to the wall thickness is,
    A. More than 15
    B. Less than 15
    C. Equal to 15
    D. None of these
38. Which of the following is not a formed head
    A. Elliptical head
    B. Flat head
    C. Torispherical head
    D. Conical head
39. The flowrate of solids from bin outlet is not a function of
    E. Bulk density
    F. Particle shape
    G. Moisture content
    H. Viscosity
40. Can we pre-stress the cylinder by subjecting cylindrical portion near inner diameter in plastic range and outer diameter is still in the elastic range.
    A. Yes
    B. No
    C. Cant Say

D. None of these

41. Helical screw agitator is used for _____
    A. Mixing highly viscous paste
    B. Blending immiscible liquid
    C. Mixing liquids at very high temperature
    D. Mixing solid
42. A propeller agitator _____
    A. Produces mainly axial flow
    B. Used for mixing high viscous pastes
    C. Runs at slow speed
    D. Used for low viscous fluids
43. Highly viscous liquids and pastes, are agitated by _____
    A. Propellers
    B. Turbine agitators
    C. Multiple blade paddles
    D. Blenders
44. Which of the following impellers will provide radial flow?
    A. Paddles
    B. Flat blade turbines
    C. Disk flat blade turbines
    D. All of the above
45. While designing pressure vessels according to 'Code for unfired vessel IS-2825', 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)
46. 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 is stored
    B. Operating temperature is more than -20°C
    C. Liquefied petroleum gas is stored
    D. Thickness of shell is less than 38 mm
47. Impellers are used to promote agitation and thoroughly mix the solution for maximum heat transfer rate (Forced Convection). Recognize this impeller.



    A. Paddle blades
    B. Propeller agitator
    C. Simple turbine impeller
    D. Helical ribbon impeller
48. Which of the following is not true for rubber lining
    A. Good Adaptability
    B. Leak proof
    C. Easy application
    D. Can be used for high purity product synthesis
49. Which operation is used to finish the glass lining
    A. Baking operation
    B. Curing operation
    C. Coating operation
    D. Induced vibration operation
50. Which of following statement is false
    A. Jacketed vessel gives more heat transfer compared to limpet coil
    B. Heat transfer coefficient of jacketed vessel is more compared to limpet coil
    C. High pressure drop is high for jacketed vessel compared to limpet coil
    D. Pumping cost is less for jacketed vessel compared to dimple coil and limpet coil