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3/F Consuelo Building, 929 Nicanor Reyes St. (formerly Morayta), Manila

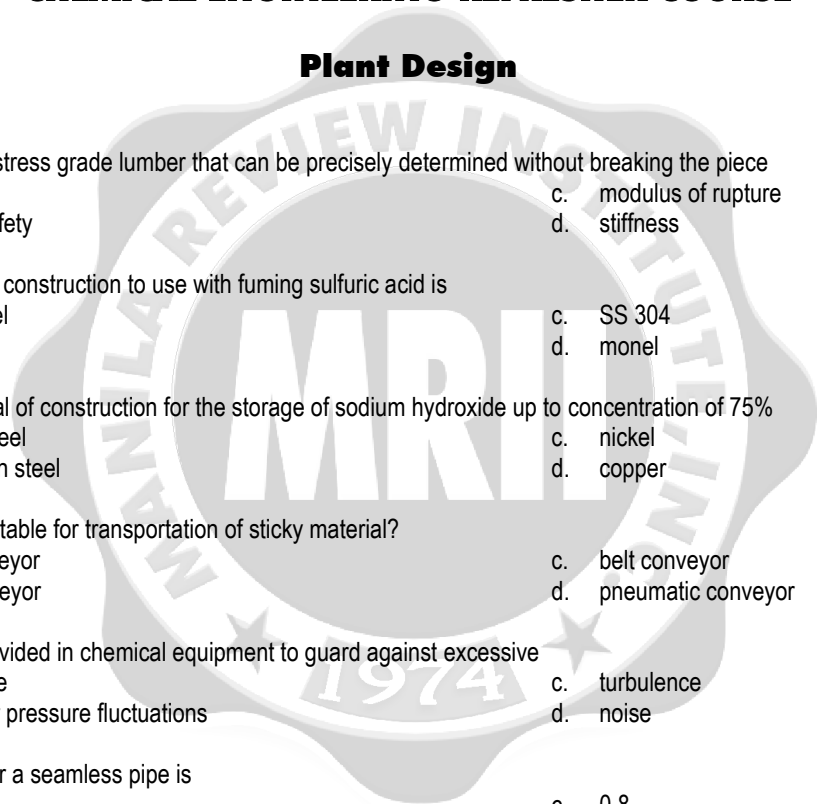
Tel. No. 8-736-MRII (6744)

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CHEMICAL ENGINEERING REFRESHER COURSE

Plant Design

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- The only strength of stress grade lumber that can be precisely determined without breaking the piece
 - rigidity
 - factor of safety
 - modulus of rupture
 - stiffness
 - A suitable material of construction to use with fuming sulfuric acid is
 - carbon steel
 - nickel
 - SS 304
 - monel
 - The cheapest material of construction for the storage of sodium hydroxide up to concentration of 75%
 - stainless steel
 - plain carbon steel
 - nickel
 - copper
 - Which is the most suitable for transportation of sticky material?
 - apron conveyor
 - screw conveyor
 - belt conveyor
 - pneumatic conveyor
 - Safety valves are provided in chemical equipment to guard against excessive
 - temperature
 - pressure or pressure fluctuations
 - turbulence
 - noise
 - The joint efficiency for a seamless pipe is
 - 1
 - 0.7
 - 0.8
 - 0.9
 - What is passivation process which is often conducted in reactors or equipment during preventive maintenance?
 - use of hydrochloric acid to prohibit potential untoward reactions leading to contamination
 - use of phosphoric acid to prohibit potential untoward reactions leading to contamination
 - use of nitric acid to prohibit potential untoward reactions leading to contamination
 - use of sulfuric acid to prohibit potential untoward reactions leading to contamination

8. A vessel is to be designed for a particular service with corrosion allowance of 0.25". The materials being selected are carbon steel, SS 304, SS 316 and Monel. The cost of money is 12%. Determine the most suitable material given 20 year study period.

material	Salvage Value, % of initial	Initial Cost	Corrosion Rate, in/yr
CS	0	275,000	0.05
SS 304	15	345,000	0.025
SS 316	15	375,000	0.025
Monel	30	380,000	0.0125

- a. CS
b. SS 304
c. SS 316
d. Monel
9. A scope of a plant design project that works on using indices to project the actual or present values of different equipment and other plant expenses essential to cost estimations
- a. Market Study
b. Economic Study
c. Technical Study
d. Financial Study
10. Calculate the cost in 1998 of a heat exchanger with an area of 90 m² using the following data:

Size of Exchanger, m ²	Year	Cost in year bought, \$
50	1988	6500
120	1990	11500

Chemical Engineering Plant Cost Index (CEPCI)

Year	CEPCI
1988	318
1990	358
1998	382

- a. USD 11,110
b. USD 10,577
c. USD 9,912
d. USD 10,173
11. A particular plant has designed an equipment and is estimating its probably cost. An old equipment with a capacity of 100,000 tons/yr costs PhP 29,000,000. Assuming $m = 0.53$, what will be the projected fixed capital investment if the design capacity is 47,000/yr?
- a. USD 18,435,576.06
b. USD 19,436,133.02
c. USD 22,866,038.85
d. USD 19,144,843.47
- 12-14. A particular cost estimation for a particular product is enlisted below:

Distribution and Marketing Costs	USD 97,200.00
Direct Production Costs	USD 1,848,737.25
Fixed Charges	USD 225,225.25
Plant Overhead Cost	USD 575,235.85
General Expenses	USD 103,523.45

12. What is the total manufacturing cost?
- a. USD 2,699,198.35
b. USD 2,699,148.35
c. USD 2,649,198.35
d. USD 2,649,198.85
13. What is the Total Product Cost?
- a. USD 2,349,921.80
b. USD 2,849,921.80
c. USD 2,349,971.80
d. USD 2,899,921.80
14. If the product rate is 20,625; what is the breakeven point selling price?
- a. USD 113.94
b. USD 138.18
c. USD 123.22
d. USD 140.60

15. Thickness calculated from the stress consideration alone gives its
- minimum wall thickness
 - maximum wall thickness
 - design wall thickness
 - material of construction
16. For high pressure process equipment/vessels, the connected nozzle should be
- welded
 - screwed
 - bolted
 - brazed
17. Welded joints may be classified into
- groove, fillet and plug
 - butt, tee, lap, corner and edge
 - bevel, V, J, and U
 - single and double
18. The economy of scale refers to the fact that as a plant, process, or piece of equipment gets larger, the cost increases at a rate smaller than the rate at which the size increases.
This is a direct consequence of the equation: $(\text{CostA}/\text{CostB}) = (\text{CapacityA}/\text{CapacityB})^n$. However, the economy of scale no longer applies when:
- $n = 1$
 - $n < 1$
 - $n > 1$
 - $n = 0$
19. A junior engineer is to design a cylindrical pressurized vessel with a diameter of 7.2m that will carry a maximum internal pressure of 12 bar (abs) at temperature of 410°C. The corrosion allowance is measured to be 0.25 inches and the vessel will be single-welded butt joint. The material is SS 302 and the allowable stress at the given temperature is 57,200 kPa. What is the practical wall
- 695 mm
 - 725 mm
 - 755 mm
 - 785 mm
20. For standard steel vessels with no corrosion allowance, operating pressure of 250 psi. and ellipsoidal head. Brummerstedt has derived a design equation according to API-ASME code for estimating its fabricated cost. The cost in Peso is shown to be:
- $$C_t = 1.76 V + 1.074 D^3 - 0.0495 DV - 0.0302 D^4$$
- where: V is the volume in cu. ft.
D is the vessel diameter in ft.
Determine the optimum diameter of a 50 cu. meter vessel.
- 4.8 ft
 - 12.5 ft
 - 5.9 ft
 - 8.6 ft

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