SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

VQAR -VERBAL QUANTITATIVE APTITUDE REASONING-II

IIYEAR/ IV SEMESTER

UNIT 1–QUANTITATIVE ABILITY III

TOPIC 8: PIPES AND CISTERNS

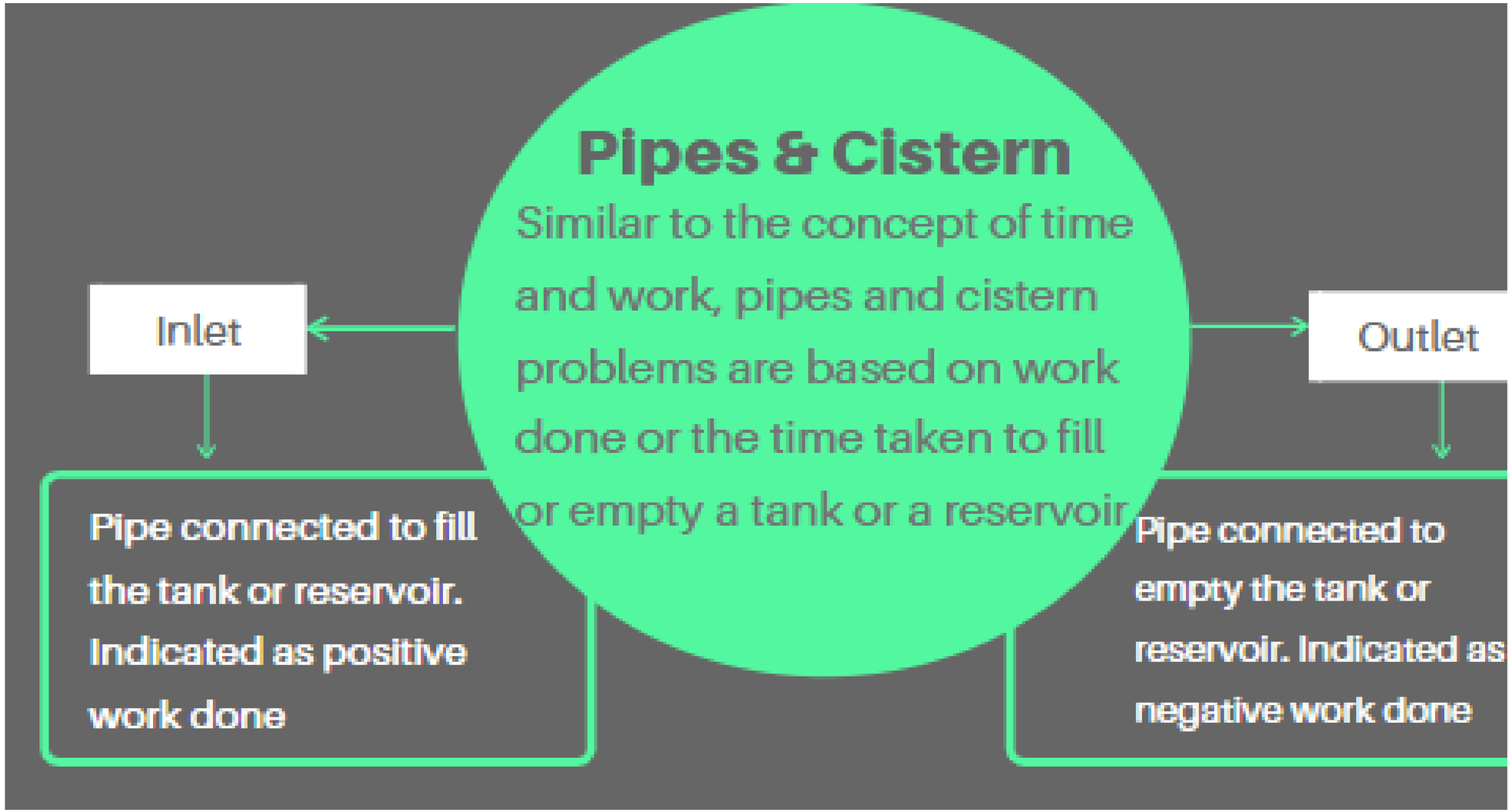
PIPES AND CISTERNS

Pipes and Cisterns

Concepts and Tricks

Pipes & Cisterns

PIPES AND CISTERNS



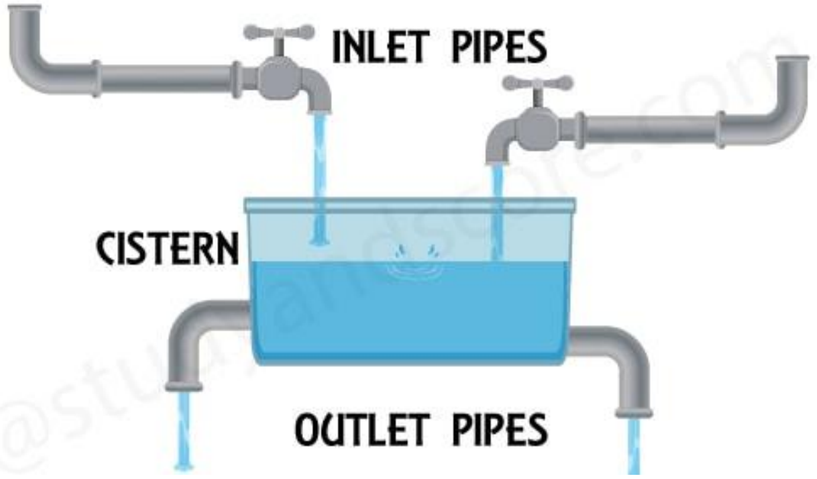
PIPES AND CISTERN - IMPORTANT FORMULAS

1. Inlet:

A pipe connected with a tank or a cistern or a reservoir, that fills it, is known as an inlet.

Outlet:

A pipe connected with a tank or cistern or reservoir, emptying it, is known as an outlet.



PIPES AND CISTERN - IMPORTANT FORMULAS

3. If a pipe can empty a tank in y hours, then:

   part emptied in 1 hour = $\frac{1}{y}$.

4. If a pipe can fill a tank in x hours and another pipe can empty the full tank in y hours (where $y > x$), then on opening both the pipes, then

   the net part filled in 1 hour = $\left(\frac{1}{x} - \frac{1}{y}\right)$.

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PIPES AND CISTERN - IMPORTANT FORMULAS

1.Three pipes A, B and C can fill a tank from empty to full in 30 minutes, 20 minutes, and 10 minutes respectively. When the tank is empty, all the three pipes are opened. A, B and C discharge chemical solutions P,Q and R respectively. What is the proportion of the solution R in the liquid in the tank after 3 minutes?

Explanation:

Part filled by (A + B + C) in 3 minutes = $3\left(\frac{1}{30}+\frac{1}{20}+\frac{1}{10}\right)=\left(3 \times \frac{11}{60}\right)=\frac{11}{20}$.

Part filled by C in 3 minutes = $\frac{3}{10}$.

$\therefore$ Required ratio = $\left(\frac{3}{10} \times \frac{20}{11}\right)=\frac{6}{11}$.

PIPES AND CISTERN - IMPORTANT FORMULAS

2.Pipes A and B can fill a tank in 5 and 6 hours respectively. Pipe C can empty it in 12 hours. If all the three pipes are opened together, then the tank will be filled in:

Explanation:

Net part filled in 1 hour $\left(\frac{1}{5}+\frac{1}{6}-\frac{1}{12}\right)=\frac{17}{60}$.

$\therefore$ The tank will be full in $\frac{60}{17}$ hours *i.e.*, $3\frac{9}{17}$ hours.

PIPES AND CISTERN - IMPORTANT FORMULAS

3. A pump can fill a tank with water in 2 hours. Because of a leak, it took 2 hours to fill the tank. The leak can drain all the water of the tank in:

Explanation:

Work done by the leak in 1 hour = $\left(\frac{1}{2} - \frac{3}{7}\right) = \frac{1}{14}$.

∴ Leak will empty the tank in 14 hrs.

PIPES AND CISTERN - IMPORTANT FORMULAS

4. A tank is filled by three pipes with uniform flow. The first two pipes operating simultaneously fill the tank in the same time during which the tank is filled by the third pipe alone. The second pipe fills the tank 5 hours faster than the first pipe and 4 hours slower than the third pipe. The time required by the first pipe is:

Explanation:

Suppose, first pipe alone takes x hours to fill the tank .

Then, second and third pipes will take $(x - 5)$ and $(x - 9)$ hours respectively to fill the tank.

$$\therefore \frac{1}{x} + \frac{1}{(x-5)} = \frac{1}{(x-9)}$$

$$\Rightarrow \frac{x - 5 + x}{x(x-5)} = \frac{1}{(x-9)}$$

$$\Rightarrow (2x - 5)(x - 9) = x(x - 5)$$

$$\Rightarrow x^2 - 18x + 45 = 0$$

$$(x - 15)(x - 3) = 0$$

$$\Rightarrow x = 15. \quad [\text{neglecting } x = 3]$$

PIPES AND CISTERN - IMPORTANT FORMULAS

5. Two pipes A and B together can fill a cistern in 4 hours. Had they been opened separately, then B would have taken 6 hours more than A to fill the. cistern How much time will be taken by A to fill the cistern separately?

Explanation:

Let the cistern be filled by pipe A alone in x hours.

Then, pipe B will fill it in $(x + 6)$ hours.

$$\therefore \quad \frac{1}{x} + \frac{1}{(x+6)} = \frac{1}{4}$$

$$\Rightarrow \frac{x + 6 + x}{x(x+6)} = \frac{1}{4}$$

$$\Rightarrow x^2 - 2x - 24 = 0$$

$$\Rightarrow (x - 6)(x + 4) = 0$$

$\Rightarrow x = 6.$ [neglecting the negative value of x]

PIPES AND CISTERN - IMPORTANT FORMULAS

6. Two pipes A and B can fill a tank in 20 and 30 minutes respectively. If both the pipes are used together, then how long will it take to fill the tank?

Explanation:

Part filled by A in 1 min = $\frac{1}{20}$.

Part filled by B in 1 min = $\frac{1}{30}$.

Part filled by (A + B) in 1 min = $\left(\frac{1}{20} + \frac{1}{30}\right) = \frac{1}{12}$.

$\therefore$ Both pipes can fill the tank in 12 minutes.

PIPES AND CISTERN - IMPORTANT FORMULAS

7. Two pipes A and B can fill a tank in 15 minutes and 20 minutes respectively. Both the pipes are opened together but after 4 minutes, pipe A is turned off. What is the total time required to fill the tank?

Explanation:

Part filled in 4 minutes = $4\left(\frac{1}{15} + \frac{1}{20}\right) = \frac{7}{15}$.

Remaining part = $\left(1 - \frac{7}{15}\right) = \frac{8}{15}$.

Part filled by B in 1 minute = $\frac{1}{20}$

$\therefore \quad \frac{1}{20} : \frac{8}{15} :: 1 : x$

$x = \left(\frac{8}{15} \times 1 \times 20\right) = 10\frac{2}{3}$ min = 10 min. 40 sec.

$\therefore$ The tank will be full in (4 min. + 10 min. + 40 sec.) = 14 min. 40 sec.

PIPES AND CISTERN - IMPORTANT FORMULAS

8. A large tanker can be filled by two pipes A and B in 60 minutes and 40 minutes respectively. How many minutes will it take to fill the tanker from empty state if B is used for half the time and A and B fill it together for the other half?

Explanation:

Part filled by (A + B) in 1 minute = $\left(\frac{1}{60} + \frac{1}{40}\right) = \frac{1}{24}$.

Suppose the tank is filled in x minutes.

Then, $\frac{x}{2}\left(\frac{1}{24} + \frac{1}{40}\right) = 1$

$\Rightarrow \frac{x}{2} \times \frac{1}{15} = 1$

$\Rightarrow x = 30$ min.


THANK
YOU!