

## PIPES AND CISTERNS

### I. INTRODUCTION

The problems on Pipes or Cisterns is an application of Time and Work. The knowledge of Time and Work helps to sort out the problems on Pipes or Cisterns.

### II. CISTERNS

Cistern is a vassel used to store water and is connected with two types of pipes. One which fills it up and another which empties it out. Cistern is also called water tank.

### III. INLET

The pipe, which is connected to cisterns to fill it, is called an Inlet.

### IV. OUTLET

The pipe, which is connected to cisterns to empty it, is called an Outlet.

### SOME IMPORTANT POINTS

1. If an inlet fill up a cistern in x hours, then part of it filled in 1hour is equal to  $1/x$
2. If an outlet empties a full cistern in y hours, then part emptied in 1 hour is equal to  $1/y$ .
3. If an inlet can fill a cistern in x hours and an outlet can empty the full cistern

in y hours, then the net part filled in 1 hour is equal to  $(\frac{1}{x} - \frac{1}{y})$  if both the pipes are opened.

$$\text{Net part filled in 1 hour} = \frac{1}{x} - \frac{1}{y} = \frac{y-x}{xy}$$

$$\therefore \text{time taken to fill the cistern} = \frac{xy}{y-x}$$

4. If an inlet can fill a cistern in x hours and an outlet can fill the same cistern in y hours, then the net part filled in 1 hour is equal to  $(\frac{1}{x} + \frac{1}{y})$ , if both the pipes are opened.

$$\text{Net part filled in 1 hour} = \frac{1}{x} + \frac{1}{y} = \frac{y+x}{xy}$$

$$\therefore \text{time taken to fill the cistern} = \frac{xy}{y+x}$$

5. If two different inlet fills the cistern in x hours and y hours respectively but an outlet empties the cisterns in z hours, then net part filled in 1 hour is given by  $(\frac{1}{x} + \frac{1}{y} - \frac{1}{z})$  if all the three pipes are opened simultaneously.

$$\text{Net part filled in 1 hour} = \frac{yz+xz-xy}{xyz}$$

$$\therefore \text{time taken to fill the cistern} = \frac{xyz}{yz+xz-xy}$$

6. The work done by the inlet is always positive whereas the work done by the outlet is always negative.

∴ Filled part of the cistern = (Sum of work done by inlets) – (Sum of work done by outlets)

1) Two taps A and B can fill a cistern in 4 hrs and 3 hrs. Find the time taken by both to fill the cisterns if they are open together.

- a)  $1\frac{5}{7}$  b)  $3\frac{5}{7}$   
c)  $2\frac{5}{7}$  d)  $4\frac{5}{7}$

2) A pipe can fill tank in 12 minutes will another pipe empty by 15 minutes. How long will take to fill the tank if both pipe are opened.

- a) 60 min b) 40 min  
c) 45 min d) 50 min

3) A pipe can fill a system in 10 hrs, due to leak age in a bottom it takes 12 hrs. When the water is full in how much time it will empty by leak.

- a) 40 hrs b) 60 hrs  
c) 50 hrs d) 65 hrs

4) A cistern normally filled in 8 Hrs but takes 2 Hrs longer to fill because of leakage in the bottom. If the certain is fill in how many hrs the leak will empty.

- a) 40 hrs b) 50 hrs  
c) 30 hrs d) 20 hrs

5) A pipe can fill in 6 hrs. Due to leak in a bottom it will in 7 hrs. When the cistern is full how much time will be.

- a) 32 b) 42  
c) 52 d) 56

6) A pump can fill the water in 2 hrs of leak it took  $7\frac{2}{3}$  hrs to fill the tank. The leak can drain all the water of the tank in?

- a)  $\frac{5}{7}$  b)  $\frac{1}{3}$   
c)  $\frac{4}{7}$  d)  $\frac{5}{9}$

7) An electric can fill a tank in 3 hrs, due to leakage, it took half an hour more than usual time to fill the tank. The leak can drine?

- a) 31 b) 21  
c) 61 d) 51

8) A swimming pool is filled by 3 pipes. The 1st 2 pipe fill the pool same time. During the 3rd pipe can fill  $\frac{2}{3}$  of the pool. 2nd pipe can fill 5 hrs faster than 1st pipe and 1 hour slower than 3rd pipe. Find the time taken by each pipe to fill the pool.

- a) ) 17, 2, 8 b) 4, 5, 17  
c) 4, 17, 3 d) 15, 10, 9

9) A swimming pool fitted with 3 pipes of uniform the 1 2 pipes operating simultaneously fill the pole at the same as

the time taken by 3 pipe alone to fill the pole. The 2 pipe fill the pole in 5 Hrs faster than the 1 pipe and 4 Hrs slower than 3 pipe. The time required by 3 pipe to fill the pole individual.

- a) 8 hrs                      b) 4 hrs  
 a) 9 hrs                      d) 6 hrs

10) Two types A and B separately filled the cistern 45 and 40 mins respectively. They started to fill the tab A turn off after few minutes. But B rest fill the cistern 23 mins. After how many minutes it turn of A.

- a) 4                              b) 5  
 c) 9                              d) 6

11) Two pipe A and B can fill the cistern in 4 Hrs had been open separately then B takes 6 hrs more than A to fill the cistern. How much time will be by A to fill the cisterns separately.

- a) 8                              b) 6  
 c) 4                              d) 3

12) 2 pipes A and B can fill water 28 mins, 40 mins respectively. The pipe C alone can make the tank empty in 40 mins. How long it will take to fill empty tank if all the 3 pipes are open.

- a) 28                              b) 38  
 c) 53                              d) 39

13) 2 inlet pipes of filled rate 10 and 15 mins and one outlet pipe emptying in 5 mins per cistern. Are all filled to be a cistern are opened together, then find when the cistern will be full.

- a) 25 min                      b) 30 min  
 c) 36 min                      d) 40 min

14) A tank contains 20 Gallen of water. If the pump takes  $12 - x/10$  min to pump to Gallen of water out of the tank. How many mins will take for the pump to empty the tank.

- a) 240-2x                      b) 222-x  
 c) None of these  
 d) Data Inadequate

15) ABC can fill in 6 hrs after working together for 2 hrs C is closed and AB fill it in 6 hrs. therefore C alone will fill the cistern. A

- a) 13 hrs                      b) 14 hrs  
 c) 18 hrs                      d) 17 hrs

16) Pipe A and Pipe B can fill the cistern separately in 12 and 16 mins. Both the pipes are opened together but after a certain time being closed only 7/8 of full quantity water flows through the farmer and only 5/6 through the letter pipe. The obstruction however been suddenly removed the cistern is filled in 3 hrs. For

that movement how long it before full flow beingly or begun.

- a) 5 ½ min                      b) 7 ½ min  
c) 8 ½ min                      d) 4 ½ min

### Practice Questions

1) 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 it will take to fill the tank?

- A.10 mins                      B.12 min  
C.15 mins                      D.20 mins

2) A cistern can be filled by a tap in 4 hours while it can be emptied by another tap in 9 hours. If both the taps are opened simultaneously, then after how much time cistern will get filled?

- A.7 hours                      B.7.1 hours  
C.7.2 hours                      D.7.3 hours

3) A tap can fill a tank in 6 hours. After half the tank is filled then 3 more similar taps are opened. What will be total time taken to fill the tank completely.

- A.2 hours 30 mins  
B.2 hours 45 mins  
C.3 hours 30 mins  
D.3 hours 45 mins

4) A water tank is two-fifth full. Pipe A can fill a tank in 10 minutes and pipe B can

empty in 6 minutes. If both the pipes are open, how long will it take to empty or fill the tank completely ?

- A.6 min to empty  
B.7 min to full  
C.6 min to full  
D.7 min to empty

5) Pipe A can fill a tank in 5 hours, pipe B in 10 hours and pipe C in 30 hours. If all the pipes are open, in how many hours will the tank be filled

- A.2.5 hours                      B.2 hours  
C.3.5 hours                      D.3 hours

6) Pipes A and B can fill a tank in 5 hours 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.

- a)  $4\frac{9}{17}$                       b)  $5\frac{9}{17}$   
c)  $3\frac{9}{17}$                       d)  $8\frac{9}{17}$

7) A leak in the bottom of a tank can empty the full tank in 6 hours. An inlet pipe fills water at the rate of 4 liters a minute. When the tank is full, the inlet is opened and due to the leak, the tank is empty in 8 hours. The capacity of the tank (in liters) is

- A.5780 liters                      B.5770 liters  
C.5760 liters                      D.5750 liters

8) An electric pump can fill a tank in 3 hours. Because of a leak in the tank, it took 3 hours 30 min to fill the tank. In what time the leak can drain out all the water of the tank and will make tank empty?

- A.10 hours                      B.13 hours  
C.17 hours                      D.21 hours

9) A tank can be filled by a tap in 20 minutes and by another tap in 60 minutes. Both the taps are kept open for 10 minutes and then the first tap is shut off. After this, the tank will be filled in what time?

- A.10 mins                      B.15 mins  
C.20 mins                      D.5 mins

10) A cistern can be filled in 9 hours but due to a leak at its bottom it takes 10 hours. If the cistern is full, then the time that the leak will take to make it empty will be?

- A.20 hours                      B.19 hours  
C.90 hours                      D.80 hours

11) Taps A and B can fill a bucket in 12 minutes and 15 minutes respectively. If both are opened and A is closed after 3 minutes, how much further time would it take for B to fill the bucket?

- A. 8 min 15 sec                      B.7 min 15 sec  
C. 6 min 15 sec                      D.5 min 15 sec

12) A tank is filled by three pipes with uniform flow. The first two pipes operating simultaneously fill the tank at 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. Find the time required by the first pipe to fill the tank?

- A.10 hours                      B.15 hours  
C .17 hours                      D.18 hours

13) One pipe can fill a tank three times as fast as another pipe. If together the two pipes can fill the tank in 36 minutes, then the slower pipe alone will be able to fill the tank in

- A.144 mins                      B.140 mins  
C.136 mins                      D.132 min

14) 12 buckets of water fill a tank when the capacity of each tank is 13.5 liters. How many buckets will be needed to fill the same tank if the capacity of each bucket is 9 liters?

- A.15 bukets                      B.17 bukets  
C.18 bukets                      D.19 bukets

15) A tank 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 tank from empty state if B

**is used for the first half time and then A and B fill it together for the other half.**

**A.15 mins**

**B.20 mins**

**C.25 mins**

**D.30 mins**

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