

HYDRO

TOTAL SCORE
(For use by event organizer
only)

Date:

Time:

SL No	Pragyan ID (PID)	Name	College	Contact Number
1				
2				
3				
4				

GENERAL RULES

- Only main event participants are eligible for attending the **BONUS ROUND** .
- **Participants are advised to bring hard copies of the question papers while coming for the event.**
- Participants may answer the questions before or after coming for the event . Submit your answers in A4 sheets.
- Answers should be submitted before the **deadline** given .
- Ensure that there are 2 pages before you start.
- There are two questions for the round.
- Each Question will carry marks specified near it.
- In case you are a **non-NITT student**, ensure that you **carry PR booklet. You will not be allowed to participate without the booklet.**
- In case of a tie in scores, a fair tiebreaker will be held.
- **Please fill the feedback form** given to you and submit it when you finish the contest.
- If you have any problems or complaints regarding the event, talk to event organizers. For any general suggestion about Pragyan, mail us to feedback@pragyan.org or contact **CRIB desk** of Pragyan.
- Once the results are announced, winners can collect price vouchers from the QA manager at the venue and certificates from the PR desk. .

Read the instructions carefully before you start answering questions

Submission deadline - 12PM 27th February 2015

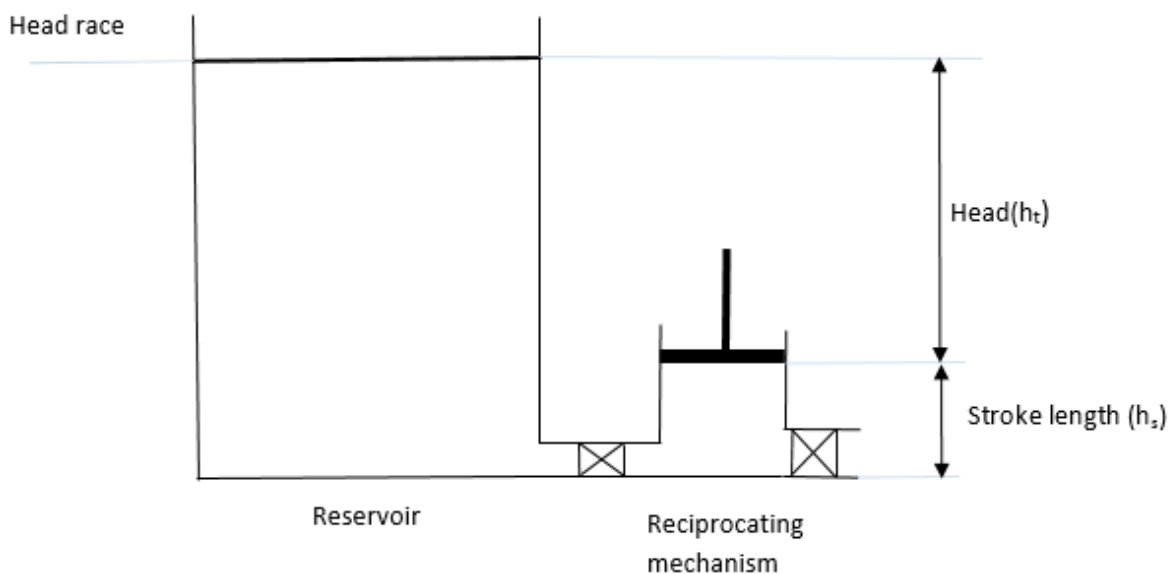
1. We all know that hydroelectric power stations generate electricity from the potential energy of water in the reservoir. It is the most widely used form of renewable energy, accounting for 16 percent of global electricity generation and is expected to increase about 3.1% each year for the next 25 years. We have different types of turbines viz Pelton, Francis, Kaplan etc. for power production based on the availability of head and flow rate of water



Turbine selection is based on the available water head, and less so on the available flow rate. In general, impulse turbines are used for high head sites, and reaction turbines are used for low head sites. Kaplan turbines with adjustable blade pitch are well-adapted to wide ranges of flow or head conditions, since their peak efficiency can be achieved over a wide range of flow conditions.

Have you ever noticed the fact that most of the hydroelectric power plants use turbines based on rotary mechanics? Do you think it is possible to replace this rotary mechanism with a reciprocating mechanism, serving the same purpose?

Suppose we are using a reciprocating mechanism for power generation as shown in the figure below



In this mechanism we have a small tank at the bottom of the reservoir which can be frequently filled and drained according to our need . This process can be used for power generation. If so what will be the hydraulic efficiency of the above mechanism ? Express in terms of stroke length(h_s) and head of the reservoir(h_t).compare the results with the rotary turbines. Make suitable assumptions with justifications.

Modify the mechanism so that it can be used for efficient power production? Express your views and redraw the figure as per your new mechanism.

Follow the clues to get a better idea

- Suppose you are operating a load (example : flywheel). Do you think this mechanism shown above will give a return stroke. If not what changes should be made to get a return stroke and thus a continuous power transmission to the load ?
- Which one is better? Stoke in vertical direction or horizontal direction? Why?
- How should the relative sizes of inlet and outlet valves be? Explain.....(8)

2. What is hydrostatic paradox ? Explain in terms of **hydrostatic forces**(2)

Clue :(make use of the figure given below for explanation)

