Dr Rajesh Kumar 176 6/5/2023

Roll No.....

National Institute of Technology, Hamirpur (HP)

End Semester Examination (May-2023) Name of the Examination: B.Tech. 8th Semester			
Course Name	: Design of Hydro Power Station	Course Code	: EE-443

Time: 3 Hours

Maximum Marks: 50

Note:

1. All Questions are compulsory 2. Draw the relevant diagrams/figures
3. Assume data wherever required

Q1.

a) With the help of suitable sketches classify the hydro-electric power plant based on water flow regulation. (5)

b) Explain the phenomenon of water hammer in the hydroelectric power station. State the procedure to overcome this problem. (5)

Q2.

a) What is/are the criteria/s for selection of number of units and capacity of hydro power plant?
A power station supplies the load as tabulated below: (5)

Time (Hrs)	Load (MW)
6 AM-8AM	1.2
8 AM-9AM	2.0
9 AM-12 Noon	3.0
12 Noon-2 PM	1.50
2 PM-6 PM	2.50
6 PM-8 PM	1.80
8 PM-9 PM	2.0
9 PM-11 PM	1.0
11 PM-5 AM	0.5
5AM-6 AM	0.8

(a)Plot the load curve and find out the load factor.
(b)Determine the proper number and size of generating units to supply this load.
(c) Find the reserve capacity of the plant and plant factor.
(d) Find out the operating schedule of the generating units selected.

b) Compute the generation cost per kWh from the following data: (5)

Installed capacity	=200 MW
Capital Cost	= Rs. 45000 per kW
Interest and depreciation	=12 %
Fuel Consumption	=0.6kg/kWh
Fuel Cost	= Rs. 1230/ 1000 kg
Other operating costs	=30 % of fuel costs
Peak load	=170 MW
Load factor	=80%

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Q3.	a)	Explain with the sketches the governing of an impulse turbine showing in detail the part played by floating fulcrum	(5)
	b)	What is meant by cavitation? How it occurs in water turbines. How cavitation can be avoided.	(5)
Q4.	a)	Explain the construction and various type of hydro generators with the help of suitable diagrams.	(5)
	b)	What are the condition for parallel operation of alternators in hydro power plant? Explain the load sharing take place between two alternators operated in parallel.	(5)
Q5.		Write Short note on I. Hydro Power Plant Stability II. Various switchyard equipment and their applications III. Generator protection against rotor faults	(10)