

UNIVERSITY OF MUMBAI

CLASS: TE (Mechanical)		Semester:- VI	
SUBJECT: HYDRAULIC MACHINERY			
Periods per week 1 Period of 60 min.	Lecture	04	
	Practical	02	
	Tutorial	--	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	--	--
	Oral Examination		--
	Term Work		25
	TOTAL		125

Sr. no.	Details	Hrs
Module 01	<p>Hydro Turbines: I. I Ge'leral: Advantages of a hydro power plant over other types of power plants, Elements of a hydro power plant, types of hydro turbines - impulse and reaction, definition of various turbine parameters like gross head, discharge, work done, input power, output power, efficiencies etc., Eulers' equation applied to a turbine, turbine velocities and velocity triangles, expression for work done.</p> <p>1.2 Pelton Turbines: Components of <vPelton turbine, definition of design parameters like speed ratio, jet ratio, estimation of various parameters like head, <u>discharge, and efficiency etc.</u>, <u>determination of number of buckets.</u></p>	08
Module 02	<p>2.1 Reaction Turbines: Types of reaction turbines - inward and outward flow, radial mixed and axial; elements of the turbine, estimation of various parameters.</p>	09
Module 03	<p>3.1 Similarity relations in turbines, definition of unit quantities and specific quantities, selection of turbines. Prediction of results of prototypes from the model test.</p> <p>3.2 Cavitations in turbines - causes, effects and remedies, Thoma's cavitations parameter G. Use of G Vs specific speed graphs. Determination of safe height of installation for the turbine.</p> <p><u>3.3 Characteristics of turbines, governing of turbines.</u></p>	07
Module 04	<p>Pumps: 4.] General: Classification of pumps - positive displacement and non - positive displacement.</p> <p>4.2 Positive - Displacement pumps: Types and applications. general features of rotary pumps like gear pumps, vane pumps etc., general feature of reciprocating pumps, definition of head, discharge. work done and efficiency, types of reciprocating pumps, indicator diagram. use of air vessel.</p>	08
Module 05	<p>5.1 Centrifugal Pl mp: Types - radial flow, mixed flow and axial flow, Priming of pumps, components of the pump, Euler's equation and velocity triangles, correction factors for the head, design constant eg., head constant, flow constant etc.,</p> <p>5.2 Types of blade profiles, aerofoil theory of axial flow pumps 5.3 Pressure recuperating devices, Radial thrust and axial thrust and methods used to balance them.</p> <p><u>5.4 Trouble. shooting in centrifugal pumps, self priming pumps.</u></p>	09

Module 06	6.1 Concept of system and system characteristics, priming of pumps. 6.2 Series and parallel' operation of pumps. System curve for branch network. Determination of operating point. 6.3 Similarity relations and affinity laws, characteristics of pumps. 6.4 Cavitations and NPSH (NPSHA, NPSHR), Determination of available and required NPSH .. 6.5 Case studies <u>using C-EI</u> (exclusively on Hydraulic Machinery).	07
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List of Experiments:

(At least six experiment from the list)

1. Variable speed and constant speed characteristics of Pelton turbines.
2. Variable speed and constant speed characteristics of Francis turbines.
3. Variable speed and constant speed characteristics of Kaplan turbines.
4. Variable speed and constant speed characteristics of centrifugal pumps plotting of Muschel curves.
5. Characteristics of reciprocating pumps, gear pump etc.
6. Series and parallel operation of pumps.
7. NPSH characteristics of pumps.
8. Characteristics of self- priming pumps.

Educational Visit:

Organize at least one visit to hydro power station. Student shall submit a brief technical report of the visit as a part of term work.

Theory Examination:

1. Question paper will comprise of total seven question, each of 20 Marks
2. Question one will be compulsory and based on maximum part of syllabus.
3. Remaining questions will be mixed in nature (for example supposed Q.2 has part (a) from module 3 then part (b) will be from any module other than module 3)
4. Only five question need to be solved. In question paper weight age of each module will be proportional to number of respective lecture hours as mentioned in the syllabus.

Term Work:

Term work shall consist of minimum 06 experiments, assignments (at least one on each module), brief report of educational visit and written test. The distribution of marks for term work shall be as follows:

- Laboratory work (experiments/assignments, report. (15)
- Test (at least one):..... (10)
- TOTAL: (25)

Text Books:

1. Hydraulic. Machinery - Jagdish La!
2. Hydraulic Machines – Vasandani
3. Centrifugal pumps and blowers - Church and Jagdish Lal
4. Fluid Mechanics and Machinery-B C S Rao, McGraw Hi//
5. Fluid Mechanics and hydraulic Machines-Gupta, Pearson Education
6. Fluid Mechanics - Douglas 5th ed, Pearson Education

References:

References: .

1. Impeller pumps - Troskolansky and Lazerkiewicz
2. Centrifugal and axial flow pumps - A. 1. Stepanoff
3. Pump Handbook - Karassik et al.
4. Hydraulic Turbines - Nechleba

