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**VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD***Accredited by NAAC with A++ Grade***B.E. (Civil Engg.) V-Semester Main & Backlog Examinations, Jan./Feb.-2024****Hydraulics and Hydraulic Machinery**

Time: 3 hours

Max. Marks: 60

*Note: Answer all questions from Part-A and any FIVE from Part-B***Part-A (10 × 2 = 20 Marks)**

Q. No.	Stem of the question	M	L	CO	PO
1.	What do you understand by 'steady and unsteady flow' in the case of channels?	2	1	1	1
2.	Find the specific energy of flowing water through a rectangular channel of width 5m when the discharge is 10 m <sup>3</sup> /s and depth of water is 3m ?	2	2	1	2
3.	What is gradually varied flow?	2	1	2	1
4.	Define hydraulic jump.	2	1	2	1
5.	List out the applications of impact of free jets	2	1	3	1
6.	Obtain an expression for the force exerted by a jet of water on a fixed vertical plate in the direction of the jet	2	1	3	2
7.	Differentiate between the impulse and reaction turbine	2	2	4	1
8.	Define the terms 'unit power', 'unit speed' and 'unit discharge'	2	1	4	2
9.	What is meant by specific speed of a pump?	2	1	5	1
10.	What are different efficiencies of a centrifugal pump?	2	2	5	1
<b>Part-B (5 × 8 = 40 Marks)</b>					
11. a)	What is specific energy curve ? Explain its salient features.	4	1	1	1
b)	A trapezoidal channel of bed width 3m and side slopes 2 horizontal : 1 vertical is laid on a slope of 0.0025. The depth of flow is 2m. Calculate the average boundary shear stress?	4	3	1	2
12. a)	Derive the standard dynamic equation for gradually varied flow?	4	3	2	1
b)	A rectangular channel has a width of 1.8m and carries a discharge of 1.8m <sup>3</sup> /s at a depth of 0.20m . Calculate 1) The specific Energy 2) Alternate depth to the existing depth ? 3) Froude numbers at the alternate depths	4	3	2	2
13. a)	Derive the expression for force exerted by a jet when it strikes an inclined flat plate which is moving in the same direction as the jet	4	3	3	1
b)	A jet of water of diameter 150 mm strikes a flat plate normally with a velocity of 12 m/s. The plate is moving with a velocity of 6 m/s in the direction of the jet and away from the jet. Find: (i) The force exerted by the jet on the plate, (ii) Work done by the jet on the plate per second, (iii) power of the jet, and (iv) efficiency of the jet.	4	3	3	2

14. a)	Explain in detail the various characteristic curves present in the case of turbines.	4	2	4	1
b)	A pelton wheel has to be designed for the following data: power to be developed = 6000 kW, Net head available = 400 m, speed = 550 rpm, Ratio of jet diameter to the wheel diameter = 1/10 and overall efficiency = 85%. Find the number of jets, diameter of jet, diameter of the wheel and quantity of water required.	4	3	4	2
15. a)	Explain the principle behind a centrifugal pump and also explain its working with a neat sketch.	4	2	5	1
b)	A centrifugal pump has an impellor 0.5m outer diameter and when running at 600rpm discharges water at the rate of 8000 litres per minute against a head of 8.5m. The water enters the impeller without whirl and shock. The inner diameter is 0.25m, and the vanes are setback at outlet at an angle of 45 degrees and the area of flow which is constant from inlet to outlet of the impeller is 0.06 m <sup>2</sup> . Determine a) Manometric efficiency of the pump b) vane angle at inlet	4	3	5	2
16. a)	What are the conditions for an hydraulically efficient Trapezoidal channel? Derive them.	4	2	1	1
b)	The velocity of flow after the jump is 0.8m/s, where the depth of flow is 1.75m. Calculate the initial depth, energy loss, power dissipated ?	4	3	2	2
17.	Answer any <i>two</i> of the following:				
a)	A jet of water 50 mm in diameter moving with velocity of 15 m/s impinges on a series of vanes moving with a velocity of 6m/s. Find the force exerted by the jet, work done by the jet and efficiency of the jet	4	3	3	2
b)	Write a brief note on classification of turbines.	4	2	4	1
c)	What do you understand by characteristics curves of a pump? What is the significance of the characteristic curves?	4	2	5	1

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	24%
ii)	Blooms Taxonomy Level – 2	33%
iii)	Blooms Taxonomy Level – 3 & 4	43%

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