

Hall Ticket Number:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Code No. : 15145 S N/O

**VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD**  
*Accredited by NAAC with A++ Grade*

**B.E. (Civil Engg.) V-Semester Supplementary Examinations, June-2023**

**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.	Differentiate between a pipe flow and open channel flow. How is the open channel classified based on Reynolds Number and Froude Number?	2	1	1	1
2.	Define critical depth and state the relationship between critical depth and specific energy.	2	1	1	1
3.	Define a hydraulic jump and discuss its classification.	2	1	2	1
4.	List out different types of profiles of an open channel flow. What is an adverse gradient?	2	1	2	1
5.	Define angular momentum principle and state any two of its applications.	2	1	3	1
6.	Show that the work done by a jet on a fixed flat plate is zero.	2	1	3	1
7.	Define specific speed of a turbine. What is its practical application?	2	1	4	1
8.	Define cavitation in a turbine and state the consequences due to formation of cavitation.	2	2	4	1
9.	State the principle of a centrifugal pump. What is priming of a pump?	2	1	5	1
10.	List out different heads of a pump and define any two of them.	2	2	5	1
<b>Part-B (5 × 8 = 40 Marks)</b>					
11. a)	What is meant by most economical section of an open channel? Derive the relationship between hydraulic mean depth and depth of flow in a most economical trapezoidal section.	4	2	1	1
b)	A lined channel is trapezoidal in shape and has side slopes of 3H:2V. It is carrying a discharge of 10 cumec and has a bed slope of 1 in 5000. Determine the dimensions of most economical section of the channel. Take Manning's friction coefficient as 0.012.	4	3,4	1	2
12. a)	Define a gradually varied flow. Derive the differential equation for steady gradually varied flow in an open channel, listing all the assumptions made.	4	2	2	1
b)	A hydraulic jump is found to occur at the downstream end of a spillway carrying a discharge of 19 cumec. The pre-jump depth is 0.82 m. Determine the post-jump depth, height, length and energy loss in the jump.	4	3,4	2	2

Contd... 2

13. a)	Derive an expression for the efficiency of a series of moving curved vanes when a jet of water strikes the vanes at one of its tips. Also derive the condition for maximum efficiency for this case.	5	4	3	1
b)	A jet of water strikes a curved fixed symmetrical vane with a velocity of 25 m/s. Diameter of the jet is 100 mm. Determine the force exerted by the jet of water in the direction of jet, if the jet is deflected through an angle of $110^\circ$ at the outlet of the curved vane.	3	3	3	2
14. a)	Discuss the classification of turbines. With a neat sketch explain the working a Francis turbine.	4	2	4	1
b)	A jet of diameter 150 mm impinges on the buckets of a Pelton wheel and the jet is deflected through an angle of $165^\circ$ by the buckets. The head available at the inlet is 450 m. Assuming coefficient of velocity of 0.97, speed ratio of 0.46 and relative velocity at out let is 85% of inlet relative velocity, find i) Force exerted by the jet on the buckets in the direction of motion ii) Power developed by the turbine.	4	3,4	4	2
15. a)	Define the specific speed of a pump. Derive an expression for the same.	3	3	5	1
b)	A centrifugal pump is to deliver 0.2 cumec at a speed of 1300 rpm against a head of 32 m. The impeller diameter is 250 mm and its width at outlet is 50 mm. The pump has a manometric efficiency of 70%. Determine the vane angle at the outer periphery of the impeller.	5	4	5	2
16. a)	What are momentum and energy correction coefficients? What are their practical applications? Derive the equation for Energy correction coefficient.	4	3	1	2
b)	Compare and contrast hydraulic jump and a surge. Derive an equation for energy loss due to formation of hydraulic jump.	4	3,4	2	1
17.	Answer any <i>two</i> of the following:				
a)	Derive an expression for the work done by the jet on the curved plate, when the plate is moving in the direction of jet.	4	4	3	1
b)	Differentiate between unit and specific quantities.	4	2	4	1
c)	What is meant by an operating characteristic curve of a pump? What are its uses?	4	2	5	1

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

i)	Blooms Taxonomy Level - 1	20%
ii)	Blooms Taxonomy Level - 2	30%
iii)	Blooms Taxonomy Level - 3 & 4	50%

\*\*\*\*\*