Hall Ticket Number:

Code No. : 14546

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A++ Grade

B.E. (Mech. Engg.) IV-Semester Main & Backlog Examinations, July-2022

Mechanics of Fluids and Hydraulic Machines

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 real and ideal fluids.	2	1	1	1
2.	Define Weight density, Specific gravity, Kinematic and Dynamic Viscosity	2	1	1	1
3.	Define a) steady and unsteady flow and b) rotational and irrotational flow.	2	1	2	1
4.	List the different forces present in a fluid flow.	2	2	2	1
5.	What are the minor and major losses during the flow of liquid through the pipe line?	2	2	3	1
6.	Define displacement thickness in a boundary layer.	2	2	3	1
7.	Find the force exerted by a jet of water of diameter 75 mm on a stationery flat plate, when the jet strikes the plate normally with velocity of 20 m/s.	2	3	4	2
8.	Define cavitation and write its effect in hydraulic turbines.	2	2	4	1
9.	If a centrifugal pump does not deliver any water when started, what may be the probable causes and how can they be remedied?	2	3	5	1
10.	Why a reciprocating pump is called positive displacement pump?	2	2	5	1
	Part-B (5×8 = 40 Marks)				
11. a)	Discuss Newton's law of viscosity and explain how viscosity varies with temperature for liquids and gases	3	2	1	1
b)	Two large plate surfaces are 2.4 cm apart. The space between the surfaces is filled with glycerine. What force is required to drag a very thin plate of 0.5 m^2 area between two large plate surfaces at a speed of 0.6 m/s if, (a) the thin plate is in the middle of the two plate surfaces, (b) the thin plate is at a distance of 0.8 cm from one plate surface. Take dynamic viscosity of glycerine as 0.81 N s /m^2.	5	4	1	2
12. a)	Difference between the Eulerian and Langrangian methods of fluid flow.	4	2	2	1
b)	State the principle and derive Bernoulli's equation for a fluid flow along a stream line.	4	1,3	2	2

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13. a)	Find the head lost due to friction in a pipe of diameter 300 mm and length 50 m through which water is flowing at a velocity of 5 m/s using Darcy's Formula.	4	4	3	2
b)	What are the different methods of preventing the separation of boundary layers?	4	1	3	1
14. a)	Show that when a jet of water impinges on a series of curved vanes, maximum efficiency is obtained when the vane is semi-circular and the velocity of jet is double the velocity of vane.	3	3	4	2
b)	Francis turbine designed to develop 160 kW working under a head 10 m and running at 200 rpm. The hydraulic losses in turbine are 15% of available energy. The overall efficiency of turbine is 80%. Assume flow ratio=0.94 and speed ratio=0.25. Calculate: (1) guide blade angle and runner vane angle at inlet and (2) diameter and width of the wheel at inlet.	5	4	4	2
15. a)	A centrifugal pump has an impeller of 30 cm outer diameter. The vane tips are radial at the outlet. For a rotational speed of 1450 rpm, calculate the manometric head developed. Assume a manometric efficiency of 82%.	4	4	5	2
b)	Draw theoretical indicator diagram of reciprocating pump and explain the effect of friction on it.	4	1	5	1
16. a)	A U - tube manometer is used to measure the pressure of water in a pipe line, which is in excess of atmospheric pressure. The left limb is connected to the pipe whereas the right limb is connected to atmosphere. The left limb of the manometer contains water and mercury. Mercury is present in the right limb. Determine the pressure of water in the main line, if the difference in level of Hg in the limbs is 10 cm and the free surface of mercury is in level with the centre of the pipe. Sketch the arrangement.	4	4	1	2
b)	Explain briefly about i)Velocity potential and ii)Stream function	4	2	2	1
17.	Answer any ***two*** of the following:				
a)	What are the minor losses in pipes? Give the appropriate formulae to calculate the losses.	4	1	3	1
b)	Explain why draft tube are used in turbines and mention the different types of draft tubes.	4	1	4	1
c)	Write the expression for specific speed of a centrifugal pump. Draw and explain operating characteristic curves for centrifugal pumps.	4	2	5	1

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

i)	Blooms Taxonomy Level – 1	30 %
ii)	Blooms Taxonomy Level – 2	31 %
iii)	Blooms Taxonomy Level – 3 & 4	39 %

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