Hall Ticket Number:

Code No. : 14566 N/O

VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD

Accredited by NAAC with A--+ Grade

B.E. (Mech. Engg.) IV-Semester Main & Backlog Examinations, July/August-2023

Fluid Mechanics 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 specific weight and specific volume of a fluid.	2	2	1	1
2.	What do you mean by single column manometer? Write its advantages.	2	1	1	1
3.	Define the following and give one practical example for each: (a) Laminar flow (b) Turbulent flow.	2	1	2	1
4.	Name the forces considered for the Euler's equation of motion.	2	2	2	1
5.	Show the variation of shear stress and velocity distribution of a viscous laminar flow through a circular pipe.	2	1	3	1
6.	Define Reynold's Number and write its significance.	2	1	3	1
7.	A jet of water issues from a nozzle with a velocity of 20 m/s and it impinges normally on a flat plate moving away from it at 10 m/s. If the cross-sectional area of the jet is 0.02 m^2 and the density of water is taken as 1000 kg/m^3, Calculate the force developed on the plate.	2	4	4	2
8.	List the functions of a draft tube.	2	1	4	1
9.	What is priming? Write its importance.	2	1	5	1
10.	What is an air vessel? List the advantages of air vessel in reciprocating pumps.	2	1	5	1
	Part-B (5 × 8 = 40 Marks)				
11. a)	State and prove the Pascal's Law and write the applications of Pascal's Law?	4	1,3	1	1,2
b)	Determine the power required to run a 300 mm diameter shaft at 400 rpm in journals with uniform oil thickness of 1 mm. A bearing of 300 mm width is used to support the shaft. The dynamic viscosity of oil is 0.03 Pas.	4	4	1	2
12. a)	The stream function for a two-dimensional flow is given by $\psi = 2xy$. Calculate the velocity at a point P(2,3). Find the velocity potential function ϕ.	4	4	2	2
b)	With help of a neat sketch explain the working of Venturimeter and derive the expression for calculation of discharge.	4	2	2	2

Contd .. 2

Code No. : 14566 N/O

13. a)	An oil of viscosity 0.1 Ns/m^2 and relative density 0.9 is flowing through a circular pipe of diameter 50 mm and of length 300 m. The rate of flow of fluid through the pipe is 3.5 liters/s. Find the pressure drop in the length of 300 m and shar stress at the pipe wall.	4	4	3	2
b)	Define displacement thickness, momentum thickness and energy thickness. Also write their expressions.	4	2	3	1,2
14. a)	A Pelton wheel is to be designed for the following data: Power to be developed 6000kW, Net heat available 300 m, speed of the rotor 550 r.p.m. ratio of wheel diameter to jet diameter is 10. Overall efficiency is 85 %. Find the no of jets, diameter of the jet and wheel and the quantity of water required.	4	4	4	2
b)	Differentiate between impulse and reaction turbines.	4	2	4	1
15. a)	The diameters of an impeller of a centrifugal pump at inlet and outlet are 30 cm and 60 cm respectively. The velocity of flow at outlet is 2 m/s and the vanes are set back at an angle of 45° at the outlet. Determine the minimum starting speed of the pump if the manometric efficiency is 70 %.	4	4	5	2
b)	A single-acting reciprocating pump, running at 60 r.p.m., delivers 0.0152 m^3/s of water. The diameter of the piston is 240 mm and stroke length 360 mm. The suction and delivery heads are 3.4 m and 11.4 m respectively. Determine: a. Theoretical discharge b. Coefficient of discharge, c. percentage slip of the pump d. power required to run the pump	4	4	5	2
16. a)	Explain U-tube differential manometer and inverted U- tube differential manometer used for pressure measurement with gauge equations.	4	2	1	1,2
b)	Define path line, streak line and stream line. For what type of flow these lines are identical.	4	1	2	1
17.	Answer any ***two*** of the following:				
a)	What are major and minor losses? List any three minor losses with their expression.	4	2	3	1
b)	Explain working of Kaplan Turbine with neat sketch	4	2	4	1
c)	Define the terms: suction head, delivery head, static head and manometric head and manometric efficiency of a centrifugal pump.	4	2	5	1,2

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

i)	Blooms Taxonomy Level – 1	24%
ii)	Blooms Taxonomy Level – 2	40%
iii)	Blooms Taxonomy Level – 3 & 4	36%

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