ACE
Engineering College

(An Autonomous Institution)

Question Paper Code: ME404PC

ACE-R20

Semester End Examination
II B. Tech- II Semester- AUGUST/SEPTEMBER -2022
FLUID MECHANICS AND HYDRAULIC MACHINES
MECHANICAL ENGINEERING

Time: 3 Hours **Max. Marks: 70**

H. T. No

Answer any 5 Questions out of 8 Questions from the following

Q.No	Question	Marks
1. a)	Explain the following terms: i) Specific weight ii) Vapour pressure iii) atmospheric pressure	6
b)	A flat plate weighing 0.45KN has a surface area of $0.1m^2$. It slides down an inclined plane at 30^0 to the horizontal, at a constant speed of 3m/s. If the inclined plane is lubricated with an oil of viscosity $0.1Ns/m^2$, find the thickness of the oil film.	8
2. a)	Explain the terms: (i) Path line (ii) Streak line (iii) Stream line and (iv) Stream tube.	8
b)	A 40 cm diameter pipe, conveying water, branches into two pipes of diameter 30 cm and 20 cm respectively. If the average velocity in the 40 cm diameter pipe is 3 m/s. Find the discharge in this pipe. Also, determine the velocity in 20 cm pipe if the average velocity in 30 cm diameter pipe is 2 m/sec.	6
3. a)	Discuss displacement thickness, energy thickness and momentum thickness.	7
b)	What is a pitot tube? How will you determine the velocity at any point with the help of pitot tube?	7
4. a)	Discuss about surface tension. Derive the pressure inside a water droplet, soap bubble and liquid jet.	7
b)	250 litres/sec of water is flowing in a pipe having a diameter of 300mm.If the pipe is bent by 135 degrees. Find the magnitude and direction of the resultant force on the bend. The pressure of water flowing is $400KN/m^2$ Take specific gravity of water is 1.	7
5. a)	A 20 x 10 cm venturimeter is provided in a vertical pipe line carrying oil of specific gravity 0.8, the flow being upward. The difference in elevation of the throat section and entrance section of the venturimeter is 50 cm. The differential U-tube mercury manometer shows a guage deflection of 40 cm. Calculate: (i) The discharge of oil. (ii) The pressure difference between the entrance section and the throat section take. Take Cd = 0.98.	12
b)	Differentiate Venturimeter and Orifice meter.	2
6. a)	A jet of water having velocity 20 m/s strikes a curved vane, which is moving with a velocity of 10 m/s. The jet makes an angle of 20^0 with the direction of motion of vane at inlet and leaves at angle of 130^0 to the direction motion of vane at outlet. Calculate (i) Vane angles at inlet. (ii) Work done per sec per unit weight of water per sec.	12
b)	Define the specific speed of the turbine.	2
7. a)	A centrifugal pump delivers water against a net head of 14.5m and design speed of 1000 rpm. The vanes are curved back to an angle of 30^0 with periphery. The impeller diameter is 300 mm and outlet width 50 mm. Determine the discharge of the pump if the manometric efficiency is 95%	12
b)	Compare centrifugal and reciprocating pumps.	2
8. a)	Explain the terms unit power, unit speed and unit discharge.	6
b)	An impulse turbine develops 4500 kW under a head of 200 meters. The turbine runner has a speed of 200 rpm and discharge of 0.8 cubic meter of water per second. If the head on the same turbine falls during summer to 184.3 meters, find the new discharge, power and speed of the turbine.	8