

Name:	 UPES UNIVERSITY WITH A PURPOSE
Enrolment No:	

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Course: Fluid Mechanics	Semester: III
Program: B. Tech. (Fire and Safety)	Time: 3 Hrs.
Course Code: MECH2023	Max. Marks: 100

Instructions:

SECTION A

S. No.		Marks	CO
Q 1	a. Write the expression of “loss of head” due to bend in pipe. b. List 3 factors on which co-efficient of bend depends	2+3	CO1
Q 2	Derive the equation of Centre of pressure using “principle of motion”	5	CO2
Q 3	Define tranquil flow using Froude number. Define Turbulent flow using Reynold’s number.	2.5+2.5	CO1
Q 4	How “bulk modulus” and “pressure” are related in adiabatic process?	5	CO2

SECTION B

Q 5	Derive “Dupuit’s equation” for calculation of equivalent size of pipe. OR Derive the equation of motion for free vortex flow.	10	CO3
Q 6	The depth of flow of water, at a certain section of a rectangular channel of 2 m wide, is 0.3 m. the discharge through the channel is 1.5 m ³ /s. Determine whether a hydraulic jump will occur, and if so, find its height and loss of energy per kg of water.	10	CO4
Q 7	An oil of sp. Gr. 0.8 is flowing through a venturi meter having inlet diameter 20 cm and throat diameter 10 cm. The oil-mercury differential manometer shows a reading of 25 cm. Calculate the discharge rate of oil through the horizontal venturi meter. Take Cd = 0.98.	10	CO4
Q 8	A circular opening, 3 m diameter, in a vertical side of a tank is closed by a disk of 3 m diameter which can rotate about a horizontal diameter. Calculate: a. The force on disc, and b. The torque required to maintain the disk in equilibrium in the vertical position when the head of water above the horizontal diameter is 4 m.	10	CO4

SECTION-C

Q 9	An open channel of most economical section, having the form of a half hexagon with horizontal bottom is required to give a maximum discharge of 20.2 m ³ /s of water.	20	CO5
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	The slope of the channel bottom is 1 in 2500. Taking Chezy's constant, $C = 60$ in Chezy's equation, determine the dimensions of the cross-section.		
Q 10	<p>A cylindrical vessel 12 cm in diameter and 30 cm deep is filled with water up to the top. The vessel is open at the top. Find the quantity of liquid left in the vessel, when it is rotated about its vertical axis with a speed of (a) 3000 r.p.m., and (b) 600 r.p.m</p> <p>OR</p> <p>At a sudden enlargement of a water main from 240 mm to 480 mm diameter, the hydraulic gradient rises by 10 mm. Estimate the rate of flow.</p>	20	CO5