Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
END-SEMESTER- DECEMBER, 2018

Course: B. Tech APE + Gas | **Semester: III**
Program: B. Tech (APE+ Gas) | **Time: 03 hrs.**
Subject- FLUID MECHANICS | **Code: MECH2007**

Max. Marks: 100

Instructions: *The question paper consists of three sections. Answer the questions section wise in the answer booklet.
Note: Assume suitable data wherever necessary

SECTION A
Attempt all the questions. All questions carry equal marks
Total Marks=20

S. No.		Marks	CO
Q 1	Define stream function and velocity potential function.	4	CO2
Q2	Discuss and derive Bernoulli's equation of motion.	4	CO3
Q3	Discuss pumps and compressors.	4	CO4
Q4	Discuss notches and weirs.	4	CO3
Q5	Discuss operation of a venturimeter.	4	CO4

SECTION B
(Answer all questions, Total Marks=40)

Q6	In brief discuss the operation of rotameter and pitot tube. OR Discuss Euler's equation of motion.	8	CO2
Q7	A pipe line carrying oil (sp.gr.0.8) changes in diameter from 300mm at position 1 to 600 mm diameter at position 2 which is 5 metres at a higher level. If the pressures at positions 1 and 2 are 100 kN/m^2 and 60 kN/m^2 respectively and the discharge is 300 litres/second. Determine: i) Loss of head; ii)Direction of flow.	8	CO3

	OR A lubricating oil of viscosity 1 poise and specific gravity 0.9 is pumped through a 30 mm diameter pipe. If the pressure drop per metre length of pipe is 20 KN/m^2, determine: i)The mass flow rate in kg/min, ii)The shear stress at the pipe wall, iii) The Reynolds number of flow, iv) The power required per 50 m length of the pipe to maintain the flow.		
Q8	Gasoline (sp.gr. 0.8) is flowing upwards a vertical pipeline which tapers from 300mm to 150mm diameter. A gasoline mercury differential manometer is connected between 300 mm and 150mm pipe section to measure the rate of flow. The distance between the manometer tappings is 1 metre and gauge reading is 500mm of mercury. Find: i) Differential gauge reading in terms of gasoline head. ii) Rate of flow. Neglect friction and other losses between tappings.	**8**	**CO3**
Q9	A triangular plate of 1 metre base and 1.5 m altitude is immersed in water. The plane of the plate is inclined at 30 degrees with free water surface and the base is parallel to and at a depth of 2 metres from water surface. Find the total pressure on the plate and the position of centre of pressure.	**8**	**CO5**
Q10	Discuss minor energy losses. Discuss boundary layer flow.	**8**	**CO4**
SECTION-C(Total Marks-40) **Answer all the questions.**			
Q11	Find the total pressure and position of centre of gravity on a triangular plate of base 2 m and height 3 m which is immersed in water in such a way that the plane of the plate makes an angle of 60 degrees with the free surface of the water. The base of the plate is parallel to the water surface and at a depth of 2.5 m from water surface.	**20**	**CO4**
Q12	Discuss in details differential manometers. OR A circular lamina of radius R is kept immersed in a liquid such that its top most point A is on the free surface. Determine the depth and width of the horizontal chord BC so that the total thrust due to hydrostatic pressure on the triangle ABC is maximum.	**20**	**CO4**

Name: **Enrolment No:**	UPES

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Subject- FLUID MECHANICS **Code: MECH2007**

Max. Marks: 100

Instructions: *The question paper consists of three sections. Answer the questions section wise in the answer booklet.
Note: Assume suitable data wherever necessary

SECTION A
Attempt all the questions. All questions carry equal marks
Total Marks=20

S. No.		Marks	CO
Q 1	Discuss how will you find out the flow rate in the discharge over a triangular notch or weir.	**4**	**CO3**
Q2	Discuss continuity equation in Cartesian coordinates.	**4**	**CO2**
Q3	Discuss Newton's law of viscosity.	**4**	**CO1**
Q4	Discuss how will you determine whether a flow is rotational.	**4**	**CO3**
Q5	Discuss what do you mean by vorticity.	**4**	**CO2**

SECTION B
(Answer all questions, Total Marks=40)

Q6	Discuss how will you find the rate of flow in venturimeter and orifice meter.	**8**	**CO2**
Q7	Discuss in details boundary layer flow. Discuss the difference between venturimeter and orificemeter. OR Discuss in details Euler's equation of motion.	**8**	**CO3**
Q8	Discuss compressibility and bulk modulus. Discuss Lagrangian method and Eulerian method of fluid motion.	**8**	**CO1**

	OR When the pressure of liquid is increased from 3.5 MN/m^2 to 6.5 MN/m^2 its volume is found to decrease by 0.08 percent. What is the bulk modulus of elasticity of the liquid?		
Q9	Discuss and derive continuity equation in Cartesian coordinates.	**8**	**CO4**
Q10	Discuss and describe different types of notches.	**8**	**CO3**
SECTION-C(Total Marks-40) **Answer the question.**			
Q11	A sliding gate 3 m wide and 1.5m high lies on a vertical plane and has a coefficient of friction of 0.2 between itself and guides. If the gate weighs 30 KN, find the vertical force required to raise the gate if its upper edge is at a depth of 9 m from free surface of water. OR Derive Bernoulli's equation for real fluid. Discuss what do you mean by Euler's equation of motion.	**20**	**CO4**
Q12	Oil of absolute viscosity 1.5 poise and density 848.3kg/m^3 flows through a 30 cm I.D. pipe. If the head loss in 3000 m length of pipe is 20m, assuming a laminar flow, determine i) the velocity,ii) Reynolds number and iii) friction factor(Fanning's).	**20**	**CO4**