Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V(New) • EXAMINATION – WINTER 2016

Subject Code:2153612 Date:17/11/2016

Subject Name:Basics of Fluid Flow

Time:10:30 AM to 01:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1		**Short Questions**	**14**
	1	Explain the property viscosity of fluid with relevant units?	
	2	Differentiate the fluid properties adhesion and cohesion?	
	3	Convert pressure head of mercury into equivalent pressure head of water	
	4	Explain the importance of critical Reynolds number in flow of fluid through a pipe?	
	5	Write the model equation representing the flow of Bingham plastics	
	6	Why water is not used as a manometric fluid in barometer to measure standard atmospheric pressure?	
	7	What is streamline and streamtube?	
	8	Mention the various types of head in a centrifugal pump.	
	9	What is the difference between skin friction and form friction?	
	10	Explain the significance of Reynolds Number?	
	11	Estimate the equivalent diameter in case of an annulus of outside diameter d_o and inside diameter d_i.	
	12	What is understood by hydraulically smooth condition?	
	13	Mention the various hydraulic coefficients of an orifice.	
	14	What is minimum fluidization velocity?	
Q.2	**(a)**	A metal ball weighs 7000N in air and 5000 N in water. What is its volume and specific gravity.	**03**
	(b)	Define boundary layer. Discuss the case of boundary layer formation for the flow of fluid over a flat plate.	**04**
	(c)	Derive the relationship to measure pressure difference between two points in case of fluid flowing through a pipe using U-tube differential manometer.	**07**
		OR	
	(c)	The velocity of a moving plate of surface area $2m^2$ is 0.6 m/s. The distance between this moving plate and fixed plate is 0.2mm. The viscosity of the fluid enclosed between the plates is 0.1 kg/m sec. Determine the power required to maintain the velocity of the plate.	**07**
Q.3	**(a)**	Explain the significance of momentum correction factor with respect to the bulk flow of a fluid stream.	**03**
	(b)	Describe in detail about the construction and working of a Pitot tube. How it is used to measure the stagnation head for flow of fluid in a pipe?	**04**
	(c)	Derive the equation for shear stress distribution for the case of fully developed flow through a pipe.	**07**
		OR	
Q.3	**(a)**	Explain the differences between centrifugal pump and positive displacement pumps?	**03**
	(b)	Water at 303 K flows through a horizontal pipe 20mm in diameter where the pressure drop per meter length is to be limited to 2.35 Pa/m. Calculate the volumetric flow rate.	**04**

	(c)	Derive the relationship to measure pressure difference between two points in case of fluid flowing through a pipe using U-tube differential manometer.	**07**
Q.4	**(a)**	With neat sketch explain the important parts in a centrifugal pump?	**03**
	(b)	Write a short note on flow pattern in agitated vessels	**04**
	(c)	An open tank contains mercury upto a depth of 0.5m and above it water upto a depth of 1m and above oil of specific gravity 0.89 for a depth of 0.5m. Find the intensity of pressure i. At the interface of oil and water ii. At interface of water and mercury iii. At the bottom of tank	**07**

OR

Q.4	**(a)**	Water is flowing through a tube of 5 mm diameter at a velocity of 0.2m/sec. Predict the kind flow pattern existing in the tube and estimate the transition length of the tube.	**03**
	(b)	Discuss in detail about the various form frictional losses in the case of fluid flow through a pipe.	**04**
	(c)	Explain the concept of fluidization differentiating aggregative and bubbling fluidization with their specific applications.	**07**
Q.5	**(a)**	Write a short note on different correction factors applied in Bernoulli's equation for fluid flow in a practical situation.	**03**
	(b)	Find the velocity of flow of oil through a pipe if the difference of mercury level in a differential manometer is 200mm. Take C_V = 0.98 and specific gravity of oil as 0.85	**04**
	(c)	Describe the various kinds of agitation equipments used in process industries with kind of flow patterns produced in them during agitation.	**07**

OR

Q.5	**(a)**	Determine the vacuum pressure in meter of water if the absolute pressure is 0.622001 bar. Assume the atmospheric pressure as 10.33 meter of water.	**03**
	(b)	Write a short note on flow pattern in agitated vessels with the ways adopted for prevention of swirling.	**04**
	(c)	A pipeline carrying oil of specific gravity 0.87 changes in diameter from 200mm diameter at a position A to 500mm diameter at a position B which is 4 meters at a higher level. If the pressure at A and B are 0.9682 atm and 0.5803 atm respectively with a discharge of 200 liters/sec. Determine the loss of head and direction of flow.	**07**

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