Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III EXAMINATION – SUMMER 2016

Subject Code:130502 **Date:04/06/2016**

Subject Name:Fluid Flow Operation

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.**

Q.1 **(a)** Define following **07**

(i) Fluid

(ii) Hydraulic radius

(iii) Schedule No.

(iv) Mach No.

(v) Cavitation

(vi) NPSH

(vii) Venna contracta

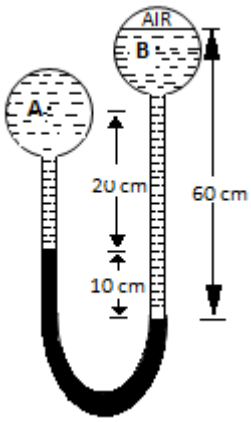
(b) Write assumptions and derive Bernouli's equation without corrections for a stream tube of increasing cross section and increasing elevation. **07**

Q.2 **(a)** Discuss the concept of hydrostatic equilibrium and derive mathematical condition of hydrostatic equilibrium. **07**

(b) Explain in detail the behavior of Newtonian and non Newtonian fluid with suitable example and neat sketch. **07**

OR

(b) A differential manometer is connected between two points as shown in figure. At point B, air pressure is 9.81×10^4 N/m^2(abs). Oil (Sp. gr. =0.9) and water are flowing through points A and B respectively. Manometric fluid is mercury(Sp.gr.=13.6). Find absolute pressure in N/m^2 at point A. **07**



Q.3 **(a)** Derive Hagen-Poiseuille equation **07**

(b) Explain fully developed flow. Also discuss concept of transition length for laminar and turbulent flow. **07**

OR

Q.3 **(a)** Briefly describe the construction and working of orifice meter and derive expression for orifice coefficient **07**

(b) An orifice meter with a sharp edge and orifice size of 50 mm is being used to measure volumetric flow rate of water in a pipe line of 250 mm i.d. If a mercury manometer reads 242 mm difference, calculate the volumetric flow rate. Density of water=1000 kg/m^3, density of mercury= 13,600 kg/m^3, viscosity of water = 1.0 mPa s. **07**

Q.4	**(a)**	Discuss in detail about gate valve and globe valve.	**07**
	(b)	Acetic acid is pumped though a 75 mm internal diameter pipe with volumetric flow rate of 0.015 m3/s. Viscosity of acid is 2.5 kg/(m s), density of acid = 1060 kg/m^3.	**07**

OR

Q.4	**(a)**	What is cavitation? Derive equation for NPSH.	**07**
	(b)	Draw neatly and discuss characteristic curves of centrifugal pump.	**07**
Q.5	**(a)**	Explain any one method of dimensional analysis.	**07**
	(b)	60 % sulfuric acid is to be pumped through a 25 mm i.d. pipe at a rate of 4000 cm^3/s. It is desired to discharge the sulfuric acid to an intermediate storage tank located to a height of 25 m. The pipe is 30 m long and includes two right angle bends. Calculate the power required by pump if pump efficiency is 56%? Specific gravity of sulfuric acid =1.531, kinematic viscosity = 0.425 cm^2/s, head loss through 90° bend = 0.8 of velocity head, Fanning friction factor= 0.0094.	**07**

OR

Q.5	**(a)**	Write a short note on centrifugal decanter.	**07**
	(b)	Write a note on types of Fluidization and applications of Fluidization	**07**

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