Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER– III EXAMINATION – SUMMER 2015

Subject Code: 130502 **Date:**04**/06/2015**

Subject Name: Fluid Flow Operations

Time:02.30pm-05.00pm **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)**	Explain the concept of hydrostatic equilibrium and derive barometric equation.	**07**
	(b)	Discuss different types of manometers used for pressure measurement with neat Sketches.	**07**
Q.2	**(a)**	Explain in detail the behavior of Newtonian and non Newtonian fluid with suitable example and neat sketch.	**07**
	(b)	A simple U-tube manometer is installed across an orifice meter.The manometer is filled with mercury (S.G. 13.6) and the liquid above mercury is CCl_4 (S.G. 1.6) The manometer reading is 200 mm. Calculate pressure drop in N/m^2.	**07**
		OR	
	(b)	A centrifuge bowl 250 mm ID is turning at 4000 rpm .It contains a layer of chlorobenzene 50 mm thick. If the density of chlorobenzene 1109 kg/m^3 and pressure at liquid surface is atmospheric, what gauge pressure is exerted on the wall of centrifuge bowl?	**07**
Q.3	**(a)**	Derive Bernoulli equation without friction and explain the correction of Bernoulli equation for fluid friction.	**07**
	(b)	Discuss friction loss from sudden expansion and sudden contraction of cross section of pipe through which incompressible fluid is flowing.	**07**
		OR	
Q.3	**(a)**	Write a short note on prevention of leakage around moving parts.	**07**
	(b)	Discuss in detail about gate valve and globe valve.	**07**
Q.4	**(a)**	Derive the Hagen-Poiseuille equation for the volumetric flow rate in a straight circular pipe.	**07**
	(b)	A pump draws a solution of S.G. 1.84 from a storage tank through a 75 mm Schedule 40 steel pipe. The efficiency of the pump is 60 %.The velocity in the suction line is 0.914 m/s. The pump discharges through a 50 mm Schedule 40 steel pipe to an over head tank. The end of discharge pipe is 15.2 m above the level of solution in the feed tank. Friction losses in entire piping system are 29.9 J/kg. Calculate pressure developed and power required by the pump .	**07**
		OR	
Q.4	**(a)**	What is meant by cavitation and priming? Explain the different characteristic curve of the centrifugal pump with neat sketches.	**07**
	(b)	A venturimeter is to be installed in a 100 mm line to measure the flow of water .The maximum flow rate is expected to be 75 m^3/h at 15°C. The manometer used to measure the differential pressure is filled with mercury and water is to fill the heads over surfaces of mercury. The water temperature is 15 °C throughout. If manometer reads 1.25 m and venturi coefficient is 0.98 , calculate throat diameter and power to operate venturimeter if 90 % of the pressure differential is recovered. Data : S.G. of mercury =13.6 , S.G. of water = 1	**07**

Q.5	**(a)**	Briefly describe the construction and working of orifice meter and derive expression for orifice coefficient.	**07**
	(b)	Discuss positive displacement pumps in detail.	**07**
		OR	
Q.5	**(a)**	Discuss boundary layer separation and wake formation.	**07**
	(b)	Prove that in laminar flow of Newtonian fluid , velocity distribution is parabola with respect to radius and with apex at the centerline of the pipe.	**07**

****