GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–V (NEW) EXAMINATION – WINTER 2018

Subject Code:2152003   **Date:16/11/2018**

Subject Name:Fluid Mechanics & Machines

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	**(a)**	Differentiate between Newtonian – Non Newtonian fluid.	**03**
	(b)	Write short note on vapour pressure.	**04**
	(c)	Derive Euler's equation of motion for flow along a stream line.	**07**
Q.2	**(a)**	Define atmospheric pressure. Enlist different types of pressures.	**03**
	(b)	State Pascal's law of pressure and prove it.	**04**
	(c)	A rectangular plane surface 3 m wide and 4 m deep lies in water in such a way that its plane makes an angle of 30° with the free surface. Determine the total pressure force and position of centre of pressure, when upper edge is 2 m below the free surface.	**07**

OR

	(c)	A block of wood of specific gravity 0.7 floats in water. Determine the meta-centric height of the block if its size is 2 m × 1 m × 0.8 m	**07**
Q.3	**(a)**	Explain with sketch stable and neutral equilibrium of floating body.	**03**
	(b)	The velocity components in a two dimensional flow are	**04**

$$u = \frac{y^3}{3} + 2x - x^2 y \ \ and \ \ v = xy^2 - 2y - \frac{x^3}{3}$$

Show that these components represent a possible case of an irrotational flow.

	(c)	Derive continuity equation for three dimensional incompressible flow and reduce the same equation to 1D steady incompressible flow.	**07**

OR

Q.3	**(a)**	Explain the meaning of each term of Bernoulli's equation.	**03**
	(b)	Write short note on Compressibility and Bulk Modulus of Elasticity	**04**
	(c)	Water is flowing through a pipe having diameter of 300 mm and 200 mm at the bottom and upper end respectively. The intensity of pressure at the bottom end is 24.525 N/cm^2 and the pressure at the upper end is 9.81 N/cm^2. Determine the difference in datum head is the rate of flow through pipe is 40 lit/s.	**07**
Q.4	**(a)**	Write short note on boundary layer separation.	**03**
	(b)	Explain Minor loss in pipe flow.	**04**
	(c)	A plate of 600 mm length and 400 mm wide is immersed in a fluid of sp. gravity 0.9 and kinematic viscosity 10^{-4} m^2/s. The fluid is moving with a velocity of 6 m/s. Calculate a. The boundary layer thickness b. Drag force on one side of the plate	**07**

OR

Q.4	**(a)**	What is Reynolds number ? State its physical significance.	**03**
	(b)	State the main components of centrifugal pump.	**04**
	(c)	Derive Hagen Poiseuille's equation.	**07**
Q.5	**(a)**	Explain positive displacement pump.	**03**
	(b)	What is priming? Explain any one method of priming.	**04**
	(c)	A turbine is to operate under a head of 25 m at 200 rpm. The discharge is 9 m^3/s. If the efficiency is 90%, determine	**07**

      a. Specific speed of machine
      b. Power generated
      c. Type of turbine

OR

Q.5	**(a)**	What are functions of air vessels in reciprocating pump? Where they are located?	**03**
	(b)	Explain difference between impulse and reaction turbine.	**04**
	(c)	The diameter of a centrifugal pump which is discharging 0.03 m^3/s of water against a total head of 20 m is 0.40 m. The pump is running at 1500 rpm. Find the head, discharge and ratio of powers of geometrically similar pump of diameter 0.25 m when it is running at 3000 rpm.	**07**

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