

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BE - SEMESTER-IV(New) EXAMINATION – SUMMER 2016**

**Subject Code:2141406**

**Date:06/06/2016**

**Subject Name:Food Engineering Transport Phenomenon**

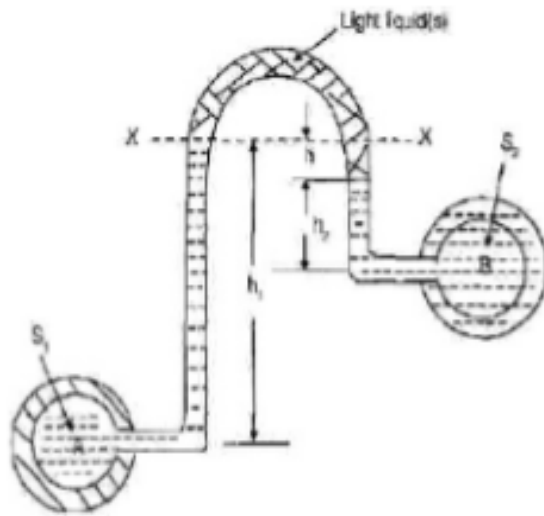
**Time:10:30 AM to 01:00 PM**

**Total Marks: 70**

**Instructions:**

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

- Q.1      Short Questions      14**
- 1** Define Specific gravity
  - 2** Density of mercury is.....kg/m<sup>3</sup>
  - 3** What is surface tension?
  - 4** Write unit of viscosity
  - 5** Write dimensions of shear stress.
  - 6** Draw velocity distribution of viscous fluid in small diameter pipe.
  - 7** What is the value of  $C_d$  for orifice meter?
  - 8** Define rotational flow.
  - 9** Define capillarity.
  - 10** Center of buoyancy definition.
  - 11** Give the range of Reynolds's number for transition flow
  - 12** Write dimensions of Reynolds number
  - 13** Define compressible flow.
  - 14** Define rate of discharge.
- Q.2      (a) Write a short note on : meta centre      03**
- (b) Derive the continuity equation for three dimensions in rectangular co-ordinates.      04**
- (c) Give the classification of devices used for pressure measurement. Derive an equation of pressure for vertical single column manometer.      07**
- A simple U-tube manometer containing mercury, it is connected to the pipe in which a fluid of specific gravity 0.8 and having vacuum pressure is flowing. The other end of the manometer is open to atmosphere. Find the vacuum pressure in pipe if the difference of mercury level in the two limbs is 40 cm and the height of the fluid in the left limb from the center of pipe is 15 cm below.
- OR**
- (c) Derive an equation of pressure difference for U-tube differential manometer.      07**
- Q.3      (a) Calculate the pressure due to a column of 0.3 m of (a) water (b) an oil of specific gravity 0.8 (c) mercury of specific gravity 13.6.      03**
- (b) Water is flowing through two different pipes In which an inverted differential manometer having an oil of specific gravity 0.8 is connected. The pressure head in pipe A is 2 m of water. Find the pressure in the pipe B for the values:  $h = 12$  cm,  $h_2 = 10$  cm,  $h_1 = 30$  cm      04**



- (c) Write a short note on variable area meter. 07

**OR**

- Q.3** (a) Prove that  $t = 2\pi (L/g)^{1/2}$  is dimensionally homogeneous equation. Where  $t$ =time,  $L$  = length of pendulum and  $g$ = gravity acceleration 03
- (b) Explain meta centre and buoyant force in brief. 04
- (c) Write a short note on boundary layer concept. 07
- Q.4** (a) Explain pascals's law of pressure. 03
- (b) Give importance of units and measurement in detail. 04
- (c) What is diffusion? Explain Fick's law of diffusion in detail. 07

**OR**

- Q.4** (a) Explain the turbulent flow through a pipe using Reynold's experiment. 03
- (b) Write significance of Reynold's Number. What is difference between model & prototype explains with example. 04
- (c) Develop Bernoulli's equation by developing Euler's equation of motion. 07
- Q.5** (a) Water is flowing through a 200 mm diameter pipe with coefficient of friction  $f=0.04$ . The shear stress at a point 40 mm from the pipe axis is 0.00981 N/cm<sup>2</sup>. Calculate the shear stress at the pipe wall. 03
- (b) A crude oil of viscosity 0.97 poise & relative density 0.9 is flowing through a horizontal circular pipe of diameter 100 mm and of length 10 m. Calculate the difference of pressure at the two ends of the pipe, if 100 kg of the oil is collected in a tank in 30 seconds. 04
- (c) Show that ratio of maximum velocity ( $U_{max}$ ) to average velocity of liquid for circular pipe for incompressible one dimensional laminar flow is 2. 07

**OR**

- Q.5** (a) Water is flowing through the pipe of diameter 15 cm find out the critical velocity of flowing water. Viscosity of water is 0.89 Pa.s 03
- (b) Write a short note on rotameter. 04
- (c) Derive relation between surface tension and pressure for liquid drop and a hollow bubble. 07

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