Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER– 4 (NEW SYLLABUS) EXAMINATION- SUMMER 2016**

**Subject Code: 2141307** **Date: 10/06/2016**

**Subject Name: Basics of Environmental Hydraulics**

**Time: 10:30 am to 1:00 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** Bernoulli's equation deals with the law of conservation of:
(a) Mass (b) Momentum
(c) Work (d) Energy

**2** Discharge coefficient for orifice meter is _____ than the venturimeter.

**3** Chezy's formula is useful for calculating
(a) force acting in a pipe
(b) discharge through pipe
(c) loss of head due to friction
(d) loss of head due to bend

**4** Cippoletti weir is a trapezoidal weir having side slope of
(a) 1 horizontal to 3 vertical
(b) 1 horizontal to 5 vertical
(c) 1 horizontal to 4 vertical
(d) All of the above

**5** Viscosity of liquid _____ with increase in temperature.

**6** The upper surface of weir over which water flows is called

**7** A piezometer tube is not suitable to measure:
(a) Small pressure
(b) Negative pressure
(c) Positive pressure
(d) All of the above

**8** A curved surface is submerged in a liquid. The horizontal component of the total pressure force on surface is
(a) Weight of liquid covered by surface
(b) Pressure force on a horizontal projection of surface
(c) Pressure force on a vertical projection of surface
(d) None of the above

**9** Loss of head due to sudden enlargement is given by _____

**10** Length of the diverging portion of venturimeter in comparison to converging section is:
(a) Less (b) More
(c) Equal (d) less or more depending on flow

**11** Path traced by a single fluid particles in motion over a period of time is known as _____

**12** Continuity equation deals with law of conservation of
(a) Mass (b) Momentum
(c) Work (d) Energy

**13** Units of kinematic viscosity is
(a) $m^2/s$ (b) stroke
(c) both a and b (d) none of these

**14** _____ is the ability to change its volume under pressure.
(a) vapour pressure (b) surface tension
(c) compressibility (d) capillary action

**Q.2** **(a)** Derive a relation for the capillary rise. **03**

**(b)** Classify different types of manometers in detail with diagrams. **04**

**(c)** An isosceles triangular plate of base 3 m and altitude 3 m is immersed vertically in an oil of s.g. = 0.8. The base of the plate coincides with the free surface of oil. Determine total pressure. **07**

**OR**

**(c)** Three pipes of diameter 300 mm, 200 mm and 400 mm and lengths 450 m, 255 m and 315 m respectively are connected in series. The difference in water levels in two tanks is 18 m. Determine the rate of flow of water if $f_1$=0.0075, $f_2$=0.0078 and $f_3$= 0.0072 respectively considering only major losses. **07**

**Q.3** **(a)** Define EGL and HGL. **03**

**(b)** Derive an expression for discharge through triangular notch. **04**

**(c)** Derive an expression for time of emptying a hemispherical tank with an orifice at its bottom. **07**

**OR**

**Q.3** **(a)** State Bernoulli's theorem. Also write down assumptions for it. **03**

**(b)** Differentiate between subcritical, critical and supercritical flow. **04**

**(c)** Derive an expression for most efficient and economical cross section for rectangular cross section. **07**

**Q.4** **(a)** Define Newton's law of viscosity. **03**

**(b)** Differentiate between **04**
(a) Rotational and irritation flow
(b) Laminar and turbulent flow

**(c)** Derive an expression for rate of flow through Venturimeter. **07**

**OR**

**Q.4** **(a)** Derive a relation for the capillary rise. **03**

**(b)** Show that the intensity of pressure force at any point in a liquid at rest is same in all direction. **04**

**(c)** Derive Darcy Weisbach equation for loss of head due to friction in a pipe line. **07**

**Q.5** **(a)** Write short note on flow through pipe in series and in parallel. **03**

**(b)** Define open channel flow. Explain its types in detail. **04**

**(c)** A triangular open channel, whose sides include an angle of $60^o$, conveys water at a uniform depth of 250 mm. If the discharge is 0.04 $m^3$/sec, determine the gradient of channel. Use the Chezy's formula assuming C = 52. **07**

**OR**

**Q.5** **(a)** Discuss about the concept of hydraulic paradox. **03**

**(b)** Show that the coefficient of discharge is always equals to the product of coefficient of velocity and coefficient of contraction. **04**

**(c)** The water is flowing through a inclined pipe having diameter 300 mm and 150 mm at top and bottom respectively. Discharge through pipe is 40 L/sec. datum level between two ends is 4 m. find the intensity of pressure at lower end if pressure at upper end is 400 $kN/m^2$. **07**

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