

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**BE – SEMESTER – VI (OLD).EXAMINATION – WINTER 2016**

**Subject Code: 160602****Date: 27/10/2016****Subject Name: Applied Fluid Mechanics****Time: 02:30 AM to 05:00 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) Explain the Navier –Stokes equation of motion for one dimensional flow. What do you understand by initial conditions and boundary conditions? **07**
- (b) Derive the Hagen- Poiseuille equation for viscous flow through a circular pipe. **07**
- Q.2** (a) Discuss the Prandtl's mixing length theory for turbulent shear stress. **07**
- (b) Explain the water hammer phenomenon in pipes. Also explain the effect of gradual and sudden closure of valves in pipe. **07**
- OR**
- (b) With a neat sketch explain the laminar and turbulent boundary layer growth over a flat plate. **07**
- Q.3** (a) Explain the displacement thickness, momentum thickness and energy thickness for boundary layer flow. **07**
- (b) An irrigation lined canal is to carry a design discharge of 14 cumecs in a trapezoidal section. The longitudinal slope is 0.0005. Calculate the dimensions of most economical section if side slope is 1.5 H to 1 V. Take Mannings  $n = 0.014$ . **07**
- OR**
- Q.3** (a) Explain the terms (i) sub-critical flow, (ii) critical depth and (iii) specific energy. **07**
- (b) Discuss with sketches the M1 and M2 type of water surface profiles with suitable examples. **07**
- Q.4** (a) A rectangular channel carries a discharge of 18 cumecs with pre-jump depth of 0.9 m. The width of channel is 6m. If the hydraulic jump forms on downstream side calculate the post-jump depth and energy loss. **07**
- (b) Explain with a neat sketch the components of Pelton turbine. **07**
- OR**
- Q.4** (a) Define specific speed and unit speed for a turbine. A turbine develops 8000 Kw power under a head of 32 m at 145 rpm. Calculate the specific speed. **07**
- (b) Why a draft tube is necessary for pressure turbine? Sketch different types of draft tube? **07**
- Q.5** (a) Explain the components of a centrifugal pump. What do you understand by manometric head? **07**
- (b) Explain the terms (i) Priming of pump (ii) foot valve and (iii) cavitation of hydraulic machines. **07**
- OR**
- Q.5** (a) Explain (i) Reynolds number, Froude number and Mach number with examples. **07**
- (b) Explain the Buckingham  $\pi$  theorem for dimensional analysis. **07**

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