

國立交通大學八十九學年度碩士班入學考試試題

科目名稱：流體力學(152) (161)

考試日期：89年4月22日 第2節

系所班別：土木工程學系

組別：丙組一般生 丙組在職生

第1頁, 共2頁

*作答前, 請先核對試題、答案卷(試卷)與准考證上之所組別與考試科目是否相符!!

1. Please choose the right statements (15%)

- (1) In an isothermal atmosphere, the pressure (a) remains constant; (b) decreases linearly with elevation; (c) increases exponentially with elevation; (d) varies in the same way as the density; (e) remains constant, as does the density.
- (2) Newton's law of viscosity relates (a) pressures, velocity, and viscosity; (b) shear stress and rate of angular deformation in a fluid; (c) shear stress, temperature, viscosity, and velocity; (d) pressure, viscosity, and rate of angular deformation; (e) yield shear stress, rate of angular deformation, and viscosity.
- (3) The horizontal component of force on a curve surface is equal to the (a) weight of liquid vertically above the curved surface; (b) weight of liquid retained by the curved surface; (c) product of pressure at its centroid and area; (d) force on a projection of curved surface onto a vertical plane; (e) scalar sum of all elemental horizontal components.
- (4) (a) The pressure center on a inclined surface is always below the centroid of the surface. (b) At a point a fluid at rest has the different pressure in all directions. (c) 760 mmHg is not a unit and scale of pressure measurement. (d) The pressure linearly varies depth in an incompressible fluid at rest. (e) The buoyant forces on two floating bodies that have the same volume but have different the volume of fluid displaced are the same.
- (5) A streamline (a) is the line connecting the midpoints of flow cross sections; (b) is defined for uniform flow only; (c) is drawn normal to the velocity vector at every point; (d) is always the path of a particle; (e) is fixed in space in steady flow.

2. For losses down the spillway of Fig.1 of 2mN/N and discharge per meter of $10\text{m}^3/\text{s}$, determine the floor elevation for the jump to occur. (15%)
3. For linear stress variation over the base of the dam of Fig. 2 (a) locate where the resultant crosses the base and (b) compute the maximum and minimum compressive stresses at the base. Neglect hydrostatic uplift. (20%)

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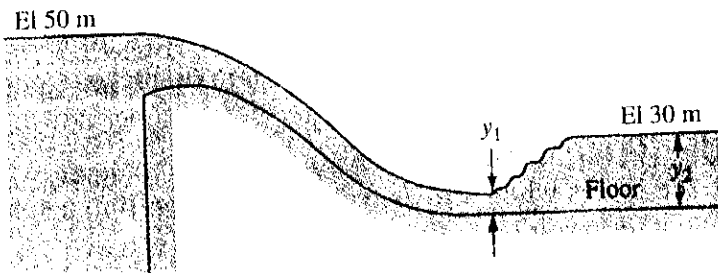


Fig. 1

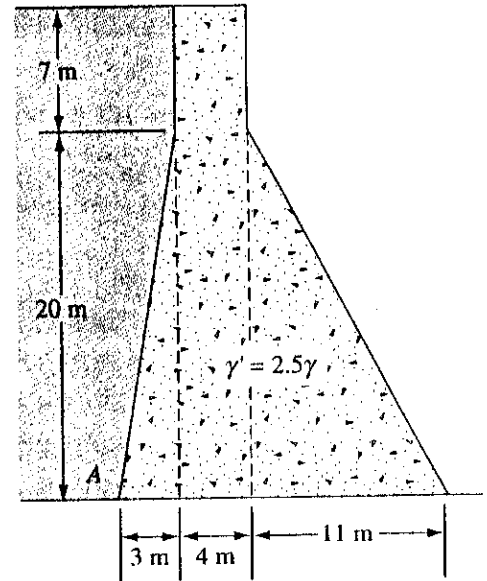


Fig. 2

4. List and define the following dimensionless parameters: (a) Reynolds number, (b) Froude number, (c) Weber number, (d) Euler number, (e) Mach number.(25%)

5. Derive the Reynolds transport equation (25%)

$$\frac{dN}{dt} = \frac{\partial}{\partial t} \int_{cv} \rho \eta dV + \int_{cs} \eta \rho \vec{v} \cdot d\vec{A}$$