Possible questions for the final exam – CEE 3500 – Fall 2005
Part 2 – Fluid dynamics, similitude, pipe flow (1)

[38]. An ideal fluid is one where no friction (viscous) effects are present. Another term for ideal fluid is ________ fluid.

(a) turbulent (b) unsteady (c) inviscid (d) compressible

[39]. For most practical applications liquids are considered __________ fluids.

(a) compressible (b) incompressible (c) inviscid (d) turbulent

[40]. If a real flow shows the fluid particles moving in layers in an orderly manner, the flow is most likely:

(a) laminar (b) turbulent (c) unsteady (d) boiling

[41]. Eddies are characteristic of ________ flows.

(a) laminar (b) turbulent (c) ideal (d) uniform

[42]. If all conditions at any point in a stream remain constant with respect to time, the flow is said to be:

(a) uniform (b) inviscid (c) unsteady (d) steady

[43]. The line traced by a single fluid particle moving through a flow is referred to as a ___________.

(a) streamline (b) pathline (c) streakline (d) boundary

[44]. The *velocity* V in a pipe of diameter D carrying a discharge Q is given by

(a) $\frac{4 \cdot Q}{\pi \cdot D^4}$ (b) $\frac{\pi \cdot Q}{4 \cdot D^4}$ (c) $\frac{4 \cdot Q}{\pi \cdot D^2}$ (d) $\frac{4 \cdot Q}{\pi \cdot D^5}$

[45]. A diagram representing streamlines and equipotential lines in a two-dimensional flow is referred to the __________ of the flow.

(a) pressure distribution (b) flow net (c) flow chart (d) free-body diagram

[46]. A point in a flow where the velocity suddenly becomes zero (e.g., at the tip of a streamlined body set against a stream) is referred to as a ____________ point.

(a) pressure (b) stagnation (c) turning (d) hinge

[47]. Whereas a flow net is based on the assumption of ideal flow, in a real flow with diverging boundaries flow particles will tend to detach from the boundaries and create recirculating zones known as __________ zones.

(a) pressure (b) converging (c) separation (d) nozzle

[48]. For a one-dimensional, unsteady flow the velocity is a function of position s and time t, i.e., $\mathbf{V} = \mathbf{V}(s,t)$. For this case, the acceleration of the flow is given by $\boldsymbol{a} = V \cdot \frac{\partial \boldsymbol{V}}{\partial s} + \frac{\partial \boldsymbol{V}}{\partial t}$. The term $\frac{\partial \boldsymbol{V}}{\partial t}$ is referred to as the _________ acceleration.

(a) local (b) convective (c) variable (d) centrifugal

[49]. For a one-dimensional, unsteady flow the velocity is a function of position *s* and time *t*, i.e., **V** = **V**(*s*,*t*). For this case, the acceleration of the flow is given by $\boldsymbol{a} = V \cdot \frac{\partial \boldsymbol{V}}{\partial s} + \frac{\partial \boldsymbol{V}}{\partial t}$. The term $V \cdot \frac{\partial \boldsymbol{V}}{\partial s}$ is referred to as the _________ acceleration.

(a) local (b) convective (c) variable (d) centrifugal

[50]. In a flow, lines drawn parallel to the velocity vectors throughout the flow at a given instant of time are called ____.

(a) pathline (b) streakline (c) streamline (d) boundary line

[51]. At a given point in a pipeline flow the term p/γ is referred to as the _________ head.

(a) elevation (b) pressure (c) velocity (d) total

[52]. At a given point in a pipeline flow the term z is referred to as the _________ head.

(a) elevation (b) pressure (c) velocity (d) total

[53]. At a given point in a pipeline flow the term $V^2/2g$ is referred to as the _________ head.

(a) elevation (b) pressure (c) velocity (d) total

[54]. In Bernoulli's theorem or the energy equation for pipelines the term z also represents the _______ energy per unit weight of the flowing fluid.

(a) kinetic (b) chemical (c) nuclear (d) potential

[54]. In Bernoulli's theorem or the energy equation for pipelines the term $V^2/2g$ also represents the _______ energy per unit weight of the flowing fluid.

(a) kinetic (b) chemical (c) nuclear (d) potential

[55]. In Bernoulli's theorem or the energy equation for pipelines the term $V^2/2g$ has dimensions of ___.

(a) velocity (b) kinetic energy (c) surface tension (d) length

[56]. In Bernoulli's theorem or the energy equation for pipelines the term p/γ has dimensions of ___.

(a) velocity (b) kinetic energy (c) surface tension (d) length

[57]. The pressure at a stagnation point is referred to as the stagnation pressure or _______ pressure.

(a) dynamic (b) elevation (c) boundary (d) turbulent

[58]. In developing the general energy equation for steady flow, the external work performed by pressure forces on the cross-sections of the flow tube is referred to as _____ .

(a) centrifugal work (b) kinetic work (c) flow work (d) shaft work

[59]. In developing the general energy equation for steady flow, the external work performed by a machine (pump, turbine) on the flow is referred to as _____ .

(a) centrifugal work (b) kinetic work (c) flow work (d) shaft work

[60]. The piezometric head at a point in a pipeline is given by:

(a) $z+p/\gamma$ (b) $z+V^2/2g$ (c) $p/\gamma+V^2/2g$ (d) $z+p/\gamma+V^2/2g$

[61]. The total energy head at a point in a pipeline is given by:

(a) $z+p/\gamma$ (b) $z+V^2/2g$ (c) $p/\gamma+V^2/2g$ (d) $z+p/\gamma+V^2/2g$

[62]. The specific energy (head) at a cross-section of an open-channel flow is given by:

(a) $z+y$ (b) $z+V^2/2g$ (c) $y + V^2/2g$ (d) $z+y+V^2/2g$

[61]. The total energy head at a cross-section of an open-channel flow is given by:

(a) $z+y$ (b) $z+V^2/2g$ (c) $y + V^2/2g$ (d) $z+y+V^2/2g$

[62]. If a pump introduces a head h_p to a pipe flow carrying a discharge Q, the power developed by the pump is given by:

(a) γQh (b) $\gamma Q^2 h$ (c) γ/Qh (d) $\gamma Q/h$

[63]. Using γ(*pcf*), Q(*cfs*), and h(*ft*), the power in *horsepower* is calculated as:

(a) $\gamma Qh/144$ (b) $\gamma Q^2 h/550$ (c) $\gamma Qh/550$ (d) $\gamma Qh/1000$

[64]. Using γ(N/m^3), Q(m^3/s), and h(m), the power in *kilowattts (kW)* is calculated as:

(a) $\gamma Qh/144$ (b) $\gamma Q^2 h/550$ (c) $\gamma Qh/550$ (d) $\gamma Qh/1000$

[65]. Let P_o represent the power output from a process or machine, and P_i represent the power input from a process or machine, then the *efficiency* (η) of the process or machine is defined as

(a) P_i/P_o (b) P_o/P_i (c) P_oP_i (d) P_o+P_i

[66]. __ True or __ False. A pump is a device that introduces energy into a pipe flow.

[67]. __ True or __ False. A turbine is a device that introduces energy into a pipe flow.

[68]. When the local absolute pressure falls below the vapor pressure of a liquid flowing in a pipeline or other enclosed device, then vapor bubbles form that can implode when carried to points of higher pressure. This phenomenon is referred to as ___________.

(a) turbulence (b) capillarity (c) cavitation (d) fracturing

[69]. The Hydraulic Grade Line (HGL) connects all the _______ heads in a pipeline flow.

(a) elevation (b) pressure (c) piezometric (d) total

[70]. The Energy Line (EL) connects all the _______ heads in a pipeline or open-channel flow.

(a) elevation (b) pressure (c) piezometric (d) total

[71]. The location of the free surface in an open channel flow represents the ________ line for that flow.

(a) Hydraulic Grade (b) Energy (c) Boundary (d) Channel Bed

[72]. The difference between total energy head between two sections of a real fluid flow in a pipeline or open channel is referred to as the _______ loss.

(a) head (b) velocity (c) discharge (e) power

[73]. Let v be the velocity distribution in a flow on a cross-section of area A. The kinetic energy correction factor in a flow is calculated as:

(a) $\frac{1}{A}\cdot\int_A v\cdot dA$ (b) $\frac{1}{V^2\cdot A}\cdot\int_A v^2\cdot dA$ (c) $\frac{1}{V^3\cdot A}\cdot\int_A v^3\cdot dA$ (d) $\frac{1}{V^4\cdot A}\cdot\int_A v^4\cdot dA$

[74]. Let v be the velocity distribution in a flow on a cross-section of area A. The momentum correction factor in a flow is calculated as:

(a) $\frac{1}{A}\cdot\int_A v\cdot dA$ (b) $\frac{1}{V^2\cdot A}\cdot\int_A v^2\cdot dA$ (c) $\frac{1}{V^3\cdot A}\cdot\int_A v^3\cdot dA$ (d) $\frac{1}{V^4\cdot A}\cdot\int_A v^4\cdot dA$

[75]. For the purpose of writing the energy equation, the gage pressure at the free surface of a reservoir open to the atmosphere or at the outlet from a pipe into the atmosphere is taken to be:

(a) 14.7 psi (b) zero (c) 1 psi (d) -1 psi

[76]. For the purpose of writing the energy equation, the velocity at the free surface of a reservoir is taken to be:

(a) 1 fps (b) 9.806 m/s (c) 32.2 fps (d) zero

[77]. If a model and prototype have similar shapes but different sizes we say they are ______ similar.

(a) dynamically (b) kinematically (c) geometrically (d) centrifugally

[78]. If the flow patterns in a geometrically similar model and prototype have similar shapes we say the model and prototype are ______ similar.

(a) dynamically (b) kinematically (c) geometrically (d) centrifugally

[79]. If the forces in a geometrically similar model and prototype have the same scale we say the model and prototype are ______ similar.

(a) dynamically (b) kinematically (c) geometrically (d) centrifugally

[80]. The Reynolds number of a flow is defined as:

(a) $\frac{\rho\cdot V\cdot L}{\mu}$ (b) $\frac{V}{\sqrt{g\cdot L}}$ (c) $\frac{V}{\sqrt{\frac{E_v}{\rho}}}$ (d) $\frac{V}{\sqrt{\frac{\sigma}{\rho\cdot L}}}$

[81]. The Froude number of a flow is defined as:

(a) $\frac{\rho\cdot V\cdot L}{\mu}$ (b) $\frac{V}{\sqrt{g\cdot L}}$ (c) $\frac{V}{\sqrt{\frac{E_v}{\rho}}}$ (d) $\frac{V}{\sqrt{\frac{\sigma}{\rho\cdot L}}}$

[82]. The cavitation number of a pipe flow is defined as:

(a) $\frac{\rho\cdot V\cdot L}{\mu}$ (b) $\frac{V}{\sqrt{g\cdot L}}$ (c) $\frac{p-p_0}{\frac{1}{2}\cdot\rho\cdot V^2}$ (d) $\frac{V}{\sqrt{\frac{\sigma}{\rho\cdot L}}}$

[83]. What flow number would you use to design a model of a dam spillway?

(a) Weber (b) Reynolds (c) Mach (d) Froude

[84]. What flow number would you use to design a model of a submarine moving in the depths of the ocean?

(a) Weber (b) Reynolds (c) Mach (d) Froude

[85]. The Darcy-Weisbach equation is used to calculate friction head loss in a pipe. The expression for the Darcy-Weisbach equation is:

(a) $h_f = f \cdot \frac{L}{D} \cdot \frac{Q^2}{2 \cdot g}$ (b) $h_f = f \cdot \frac{L}{D} \cdot \frac{V^2}{g}$ (c) $h_f = f \cdot \frac{L}{D} \cdot \frac{V^2}{2 \cdot g}$ (d) $h_f = f \cdot \frac{L^2}{D} \cdot \frac{V^2}{2 \cdot g}$

[86]. The Darcy-Weisbach friction factor *f* for a laminar flow in a pipe is given by:

(a) 32.2/**R** (b) 9.806/**R** (c) 144/**R** (d) 64/**R**

[87]. For turbulent flow, the Darcy-Weisbach friction factor *f* is a function of the relative roughness *e/D* and of the Reynolds. The graphical representation of the function *f* (*e/D*, **R**) is called the _____ diagram.

(a) Moody (b) Prandtl (c) von Karman (d) Pascal