[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
   \[ \frac{4 \cdot Q}{\pi \cdot D^4} \]  (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., \( V = V(s,t) \). For this case, the acceleration of the flow is given by
   \[ a = V \cdot \frac{\partial V}{\partial s} + \frac{\partial V}{\partial t} \]. The term \( \frac{\partial V}{\partial t} \) 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 \( a = V \frac{\partial V}{\partial s} + \frac{\partial V}{\partial t} \). The term \( V \frac{\partial V}{\partial s} \) 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 \( p/\gamma \) 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 \( p/\gamma \) 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) \( z + \frac{p}{\gamma} \) (b) \( z + \frac{V^2}{2g} \) (c) \( \frac{p}{\gamma} + \frac{V^2}{2g} \) (d) \( z + \frac{p}{\gamma} + \frac{V^2}{2g} \)

[62]. The specific energy (head) at a cross-section of an open-channel flow is given by:
   (a) \( z + y \) (b) \( z + \frac{V^2}{2g} \) (c) \( y + \frac{V^2}{2g} \) (d) \( z + y + \frac{V^2}{2g} \)

[61]. The total energy head at a cross-section of an open-channel flow is given by:
   (a) \( z + y \) (b) \( z + \frac{V^2}{2g} \) (c) \( y + \frac{V^2}{2g} \) (d) \( z + y + \frac{V^2}{2g} \)

[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) \( \gamma Qh \) (b) \( \gamma Q^2 h \) (c) \( \gamma Qh \) (d) \( \frac{\gamma Qh}{1000} \)

[63]. Using \( \gamma (pcf) \), \( Q (cfs) \), 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 \( \gamma (N/m^3) \), \( Q (m^3/s) \), and \( h(m) \), the power in kilowatts \( (kW) \) 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 \textit{efficiency} (\( \eta \)) 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) \( \frac{1}{A} \int_A v \cdot dA \)  
(b) \( \frac{1}{V^2} \cdot A \int_A v^2 \cdot dA \)  
(c) \( \frac{1}{V^3} \cdot A \int_A v^3 \cdot dA \)  
(d) \( \frac{1}{V^4} \cdot A \int_A v^4 \cdot dA \)

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

[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) \( \frac{V}{E_v} \)  
(d) \( \sqrt{\frac{\sigma}{\rho \cdot L}} \)

[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) \( \frac{E_v}{\rho} \)  
(d) \( \sqrt{\frac{\sigma}{\rho \cdot L}} \)

[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) \( \sqrt{\frac{\sigma}{\rho \cdot L}} \)
[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