

FEDERAL UNIVERSITY OF TECHNOLOGY, OWERRI
DEPARTMENT OF MECHANICAL ENGINEERING
2012/2013 HARMATTAN SEMESTER EXAMINATION

COURSE: ENG 309 – FLUID MECHANICS

TIME: 2 hours

INSTRUCTIONS: (1). ANSWER ALL QUESTIONS. (2) SHADE "A" FOR "TRUE" AND "B" FOR "FALSE". (3).FOR ANSWERS THAT ARE NOT PROVIDED, WRITE THE ANSWERS IN WORDS.

SECTION A

- 1) The pressure as the depth of the liquid increases (a) increase (b) decrease (c) remain unchanged (d) none of the above
- 2) The height of the free surface above any point is known as (a) static head (b) intensity of pressure (c) pressure head (d) none of the above
- 3) Any pressure measured above the absolute zero of pressure is termed as (a) atmospheric pressure (b) guage pressure (c) absolute pressure (d) none of the above
- 4) The fundamental S.I. unit of pressure is N/m^2 ; this is also known as (a) Pascal (b) stoke (c) poise (d) none of the above
- 5) Calculate the force required to cause a plate of area $0.1m^2$ to slide on a surface at a speed of $1mms^{-1}$. The plate is separated from the surface by a film of oil $10^{-5}m$ thick whose coefficient of viscosity is $1.5Nsm^{-2}$. (a) 5N (b) 15N (c) 18N (d) 25N
- 6) The Reynolds number is the ratio of forces to viscous forces. (a) inertia (b) buoyancy (c) shear (d) tangential
- 7) Bulk modulus is the ratio of differential pressure to percentage decrease in (a) volume (b) temperature (c) entropy (d) elasticity
- 8) A fluid is said to be compressible when it's is not constant (a) density (b) density (c) shear force (d) volume
- 9) An ideal fluid is one which is devoid of (a) friction (b) flow (c) acceleration (d) matter
- 10) Mach number is the ratio of the velocity of flow to (a) sonic speed (b) acceleration (c) height (d) volume
- 11) The weight of a substance in air is different from its weight in water due to (a) buoyancy (b) compressibility (c) reaction (d) shear
- 12) Turbulent flow occurs when the Reynolds number becomes greater than (a) 2,100 (b) 760 (c) 35,000 (d) 14.7
- 13) If fluid A has a higher density than fluid B, then, the kinematic viscosity of A is higher than that of fluid B. (a) yes (b) No (c) more information required (d) none of these
- 14) When temperature is increased, the density of a fluid (a) increases (b) decreases (c) does not change (d) reverses
- 15) Heat loss during fluid flow is the same as loss of (a) volume (b) energy (c) heat (d) symmetry
- 16) During the flow of a fluid in a horizontal conduit when velocity increases the decreases (a) angular velocity (b) pressure (c) viscosity (d) kinematic viscosity
- 17) For a liquid of density of $835kg/cm^3$, obtain the specific weight. (a) $8.20KN/m^3$ (b) $10.2KN/m^3$ (c) $7.0KN/m^3$ (d) $15KN/m^3$.
- 18) At what pressure will air at $49^\circ C$ weigh $18.7N/m^3$ (a) 176KPa (b) 245KPa (c) 167KPa (d) 671KPa.
- 19) What force is necessary to lift a thin wire ring 45mm in diameter from a water surface at $20^\circ C$? Neglect the weight of the wire (a) 0.0806N (b) 0.0206N (c) 52.36N (d) 5.236N
- 20) What pressure must be applied to water to reduce its volume by 1.25% if the bulk modulus of elasticity is 2.19GPa (a) 0.274GPa (b) 0.00274GPa (c) 0.0274GPa (d) 0.724GPa

SECTION B

- 21) A pipe is described as an open channel, when it is ... filled with fluid. (a) partially (b) completely (c) over
- 22) Friction in an open channel is best calculated using an equation called: (a) Darcy – weisbach formula (b) Chezy's formula (c) Bernoulli's equation
- 23) Darcy – Weisbach equation is used to calculate loss of head due to (a) sudden enlargement (b) surface roughness (c) none of the above
- 24) Loss of head at exit of a pipe is given as: (a) $\frac{V}{2g}$ (b) $\frac{V^2}{g}$ (c) $\frac{V^2}{2g}$
- 25) There is specific **relationship** between the slope of the Energy Gradient Line and the slope of the axis of the pipe. (a) true (b) false
- 26) The energy loss in a pipeline is due to: (a) surface roughness only (b) viscous action only (c) friction offered by pipe wall as well as by viscous function
- 27) The Energy Gradient Line (E.G.L) always drops in the direction of flow because of: (a) flow rate (b) pressure changes (c) loss of head
- 28) Which of the following statement is **false**: (a) Hydraulic Gradient Line (H.G.L) may rise or fall depending on the loss of head (b) The slope of H.G.L can be equal to the slope of E.G.L (c) none of the above
- 29) Which of the following statement is **true**: (a) the sum of potential head and the velocity head at any point is called the piezometric head (b) the vertical intercept between the H.G.L and E.G.L is equal to velocity head (c) all of the above
- 30) Water hammer is caused due to: (a) sudden partial opening of a valve in a pipeline (b) sudden closure of a valve in pipe flow (c) incompressibility of fluid
- 31) Which of the following statement is **false** about Water hammer in pipes: (a) the head pressure is proportional to time required to close the valve (b) the assumption that liquid is incompressible is incorrect (c) none of the above
- 32) Dupit's equation for an equivalent pipe is given as: (a) $\frac{L}{D^5} = \left[\frac{L_1}{D_1^5} + \frac{L_2}{D_2^5} + \frac{L_3}{D_3^5} + \right]$ (b) $\frac{L}{D^3} = \left[\frac{L_1}{D_1^3} + \frac{L_2}{D_2^3} + \frac{L_3}{D_3^3} + \right]$ (c) none of the above
- 33) Which of the following is **true** for fluid flow in parallel pipes: (a) rate of discharge in the main line equals the sum of the discharges in each of the parallel pipes (b) the loss of head in each pipe is same (c) all of the above

- Two reservoirs are connected by a pipeline consisting of two pipes, one of 150mm diameter and length 6m and the other of diameter 225mm and 16m length. They have difference of levels in the reservoir as 6m and friction factor = 0.04.

- 34) What is the loss of head due to friction in pipe one: (a) 5.03m (b) 4.78m (c) 3.97m
- 35) What is the loss of head due to friction in pipe two: (a) 1.40m (b) 1.04m (c) 1.84m
- 36) What is the loss of head at entrance to the pipe one: (a) 0.97m (b) 0.31m (c) 1.6
- 37) What is the loss of head due to sudden enlargement: (a) 0.19m (b) 0.64m (c) 0.43m
- 38) What is the loss of head due to obstruction in the pipe: (a) 0.12m (b) 0.24m (c) 0.36m
- 39) What is the velocity of the fluid in pipe one: (a) 2.11m (b) 3.50m (c) 4.11m
- 40) What is the discharge: (a) 0.11m (b) 0.06m (c) 0.82m
- 41) Power of a stream of fluid is (a) rate of energy transfer (b) weight per unit time (c) energy per unit weight (d) none of the above.
- 42) Laminar flow is the flow regime when fluids flow at (a) low velocities (b) high velocities (c) low velocities with lateral mixing (d) low velocities without lateral mixing.
- 43) Turbulent flow is the flow regime when fluids flow at (a) high velocities (b) low velocities (c) low velocities with lateral mixing (d) high velocities with lateral mixing.
- 44) For compressible fluids, mach number > 1 characterises (a) sonic (b) super-sonic (c) sub-sonic speed
- 45) For compressible fluids mach number < 1 characterises (a) sonic (b) hyper-sonic (c) ultra-sonic
- 46) Reynold's number is used to characterize flow in incompressible fluids. True or False
- 47) Velocity of a flowing fluid through a pipe at the solid fluid interface is (a) 0 (b) infinite (c) negative
- 48) In uniform flow, the velocity of fluid at a given instant at any point is different. True or False
- 49) In unsteady state uniform flow, velocity of a flowing fluid is the same at every point but does not change with time. True or False
- 50) In steady state uniform flow, velocity of a flowing fluid is the same at every point but does not change with time. True or False
- 51) A boundary layer is part of a moving fluid in which the fluid motion is influenced by the presence of a solid boundary. True or False
- 52) Cavitation occurs due to formation and collapse of bubbles in pumps. True or False
- 53) In unsteady non-uniform flow if $v=f(s,t)$, what is dv ? (a) density (b) specific volume (c) change in speed
- 54) Cavitation causes abnormal sound and vibration in pumps. True or False
- 55) Velocity of a real fluid flowing in a pipe is the same at every point of the cross section. True or False
- Using Fig 1 below, Calculate
- 56) Q_{AB} (a) $3.3912\text{m}^3/\text{sec}$ (b) $3.0151\text{m}^3/\text{sec}$ (c) $4.5120\text{m}^3/\text{sec}$ (d) $2.7521\text{m}^3/\text{sec}$.
- 57) V_{BC} (a) 0.93m/s (b) 1.92m/s (c) 1.73m/s (d) 2.42m/s .
- 58) V_{CD} (a) 3.25m/s (b) 1.25m/s (c) 2.15m/s (d) 2.25m/s .
- 59) D_{CE} (a) 1.073m (b) 1.164m (c) 1.243m (d) 0.173m .
- 60) Power input of a pump is power output multiplied by efficiency. True or False
- 61) In orifice meter, actual gas flow rate is obtained as the product of theoretical flow rate and orifice coefficient. True or False
- 62) Acceleration due to movement of the fluid particle from one point to another point at which the velocity at the given instant is different is called.....
- 63) Acceleration due to change of velocity at every point with time is called.....
- 64) $V^2/2g$ in energy equation is called.....
- 65) Potential flow is flow of an ideal fluid which is
- 66) The branch of engineering-science which deals with water at rest or in motion is called (a) hydraulics (b) fluid mechanics (c) applied mechanics (d) kinematics
- 67) A solid can resist which of the following stresses? (a) Tensile (b) compressive (c) shear (d) all of the above
- 68) possesses no definite volume and is compressible. (a) solid (b) liquid (c) gas (d) vapour
- 69) A real practical fluid possesses which of the following? (a) viscosity (b) surface tension (c) compressibility (d) density
- 70) The ratio of the specific weight of the fluid to the specific weight of a standard fluid is known as (a) specific volume (b) weight density (c) specific gravity (d) viscosity
- 71) The property of a fluid which determines its resistance to shearing stress is called (a) viscosity (b) surface tension (c) compressibility (d) none of the above
- 72) Newton's law of viscosity is given by the relation: (a) $\tau = \mu^2 du/dy$ (b) $\tau = \sqrt{\mu} \frac{du}{dy}$ (c) $\tau = \mu \frac{du}{dy}$ (d) $\tau = \mu^3 \frac{du}{dy}$
- 73) Fluids which do not follow the linear relationship between shear stress and rate of deformation are termed as
- 74) The printer's ink is an example of (a) Newtonian fluid (b) non-Newtonian fluid (c) Thixotropic substance (d) elastic solid
- 75) The viscosity of liquids with increase in temperature (a) decrease (b) increase (c) first decrease and then increase (d) first increase and then decrease
- 76) Surface tension is caused by the force of at the free surface (a) cohesion (b) adhesion (c) both (a) and (b) (d) none of the above.
- 77) Which of the following is an example of phenomenon of surface tension? (a) rain drops (b) rise of sap in a tree (c) break up of liquid jets (d) all of the above
- 78) Surface tension is expressed in (a) N/m (b) N/m^2 (c) N^2/m (d) N/m^3
- 79) is a phenomenon by which a liquid rises into a thin glass tube above or below its general level. (a) surface tension (b) capillarity (c) cohesion (d) adhesion
- 80) The capillarity rise of water in the glass tube is given by (a) $h = \frac{2\sigma}{wd}$ (b) $h = \frac{3\sigma}{wd}$ (c) $h = \frac{4\sigma}{wd}$ (d) $h = \frac{6\sigma}{wd}$