School	Engineering			Department	Mechanical
Course Name	Fluid Mechanics -1			Course No.	0944706
Academic Year	2023-2024	Semester	Summer	Exam Type	Quiz-4
Exam Date				Exam Time	15 minutes

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1. **Dimensional analysis is primarily used to:**
   - a) Calculate exact numerical values for fluid properties.
   - b) Reduce the number of variables in a physical problem.
   - c) Determine the fluid flow rate in a pipe.
   - d) Simplify the design of pumps and turbines.
   - **Answer: b) Reduce the number of variables in a physical problem.**
2. **The Buckingham π theorem is essential for:**
   - a) Determining the velocity profile in a pipe.
   - b) Generating dimensionless groups from a set of variables.
   - c) Calculating pressure drops in conduits.
   - d) Designing open channels.
   - **Answer: b) Generating dimensionless groups from a set of variables.**
3. **In dimensional analysis, the term 'geometric similarity' implies:**
   - a) All physical dimensions are identical.
   - b) The shapes of the model and prototype are similar.
   - c) The velocities are the same at all points.
   - d) The forces are directly proportional.
   - **Answer: b) The shapes of the model and prototype are similar.**
4. **Which of the following is a common dimensionless number used in fluid mechanics?**
   - a) Reynolds number
   - b) Mach number
   - c) Froude number
   - d) All of the above
   - **Answer: d) All of the above**
5. **Dynamic similarity between a model and a prototype is achieved when:**
   - a) The forces in the model are the same as those in the prototype.
   - b) The dimensionless numbers are identical in both.
   - c) The velocities in both are equal.
   - d) The model and prototype have identical mass.
   - **Answer: b) The dimensionless numbers are identical in both.**
6. **The use of dimensional analysis is particularly important when:**
   - a) Dealing with complex fluid systems where direct analysis is difficult.
   - b) Simplifying linear equations.
   - c) Calculating head loss in conduits.
   - d) Designing fluid control systems.
   - **Answer: a) Dealing with complex fluid systems where direct analysis is**

difficult.

7. **Which of the following represents kinematic similarity?**
   - a) Identical time scales
   - b) Similar velocity profiles in both model and prototype
   - c) Identical flow rates
   - d) Same pressure at all points
   - **Answer: b) Similar velocity profiles in both model and prototype**
8. **Which of the following dimensionless groups is associated with the effects of gravity in free-surface flows?**
   - a) Reynolds number
   - b) Froude number
   - c) Weber number
   - d) Euler number
   - **Answer: b) Froude number**
9. **The Moody diagram is used to determine:**
   - a) The Reynolds number.
   - b) The friction factor for pipe flow.
   - c) The velocity distribution in turbulent flow.
   - d) The critical depth in open channels.
   - **Answer: b) The friction factor for pipe flow.**
10. **In laminar flow through a circular pipe, the velocity profile is:**
    - a) Uniform.
    - b) Parabolic.
    - c) Linear.
    - d) Turbulent.
    - **Answer: b) Parabolic.**
11. **The critical Reynolds number for transition from laminar to turbulent flow in a pipe is approximately:**
    - a) 1000
    - b) 2000
    - c) 2300
    - d) 4000
    - **Answer: c) 2300**
12. **Head loss in turbulent flow is primarily due to:**
    - a) Viscous effects.
    - b) Friction along the pipe walls.
    - c) Gravity.
    - d) Pressure variations.
    - **Answer: b) Friction along the pipe walls.**
13. **For a given pipe length and diameter, doubling the flow rate will:**
    - a) Double the head loss.
    - b) Quadruple the head loss.
    - c) Halve the head loss.
    - d) Have no effect on head loss.
    - **Answer: b) Quadruple the head loss.**

14. **In fully developed turbulent flow, which region has the highest velocity gradient?**
    - a) Near the center of the pipe
    - b) Near the pipe wall
    - c) At the pipe entrance
    - d) At the pipe exit
    - **Answer: b) Near the pipe wall**
15. **Which of the following does not affect the friction factor in a turbulent pipe flow?**
    - a) Pipe material roughness
    - b) Reynolds number
    - c) Pipe length
    - d) Flow velocity
    - **Answer: c) Pipe length**