KATHMANDU UNIVERSITY
End Semester Examination [C]
December, 2024

Marks Scored:

Level : B.E.
Year : III

Course : MEEG 301
Semester : I

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date : 12 DEC 202

SECTION "A"
[14 Q. × 1 = 14 marks]

Choose and encircle in the most appropriate option from each set of choices

1. Which of the following combinations results in the highest capillary rise in a tube?
   [ ] Large diameter, high surface tension [ ] Small diameter, high surface tension
   [ ] Large diameter, low surface tension [ ] Small diameter, low surface tension

2. If the shear stress in a Newtonian fluid is zero, what can be inferred about the fluid motion?
   [ ] The fluid is at rest [ ] The fluid has uniform velocity
   [ ] There are no velocity gradients [ ] The fluid has zero viscosity

3. For a completely submerged object, the buoyant force is equal to:
   [ ] The volume of the object times the density of the fluid times gravity.
   [ ] The weight of the object.
   [ ] The volume of the object times the density of the object times gravity.
   [ ] The weight of the displaced fluid.

4. If viscosity of fluid is more, the thickness of boundary layer is
   [ ] more [ ] less
   [ ] not affected by change in viscosity [ ] zero

5. The acceleration of a fluid element can be expressed as the sum of local acceleration and convective acceleration. Which of the following is true about convective acceleration?
   [ ] It results from changes in velocity with time.
   [ ] It results from the change in velocity due to spatial position.
   [ ] It is always zero for steady flow.
   [ ] It is associated with the pressure gradient.

6. What is the effect of change in Reynold's number on friction factor in turbulent flow?
   [ ] As the Reynold's number increases the friction factor increases in turbulent flow
   [ ] As the Reynold's number increases the friction factor decreases in turbulent flow
   [ ] Change in Reynold's number does not affect the friction factor in turbulent flow
   [ ] As the Reynold's number increases the friction factor behaves asymptotically in turbulent flow

7. The actual path traveled by an individual fluid particle over some period is called a
   [ ] Pathline [ ] Streamline [ ] Streakline [ ] Timeline

8. The Reynolds number is used to characterize fluid flow. It does NOT depend on:
   [ ] Fluid velocity [ ] Pipe diameter [ ] Fluid density [ ] Pressure gradient

9. A fluid flows in a 25-cm-diameter pipe at a velocity of 4.5 m/s. If the pressure drop along the pipe is estimated to be 6400 Pa, the required pumping power to overcome this pressure drop is

[ ] 452 W [ ] 640 W [ ] 923 W [ ] 1235 W

10. For flow through a pipe, the relationship between the Reynolds number and the friction factor for turbulent flow is:

[ ] Linear [ ] Inversely proportional
[ ] Complex, involving pipe roughness [ ] Exponential

11. A hydraulic turbine is used to generate power by using the water in a dam. The elevation difference between the free surfaces upstream and downstream of the dam is 120 m. The water is supplied to the turbine at a rate of 150 kg/s. If the shaft power output from the turbine is 155 kW, the efficiency of the turbine is

[ ] 0.77 [ ] 0.80 [ ] 0.82 [ ] 0.85 [ ] 0.88

12. According to Darcy's formula, the loss of head due to friction in the pipe is _____ (where f = Darcy's coefficient, l = Length of pipe, v = Velocity of liquid in pipe, and d = Diameter of pipe)

[ ] $flv^2/2gd$ [ ] flv^2/gd [ ] $3flv^2/2gd$ [ ] $4flv^2/2gd$

13. The pitot tube is used to measure _____.

[ ] Velocity at stagnation point [ ] Stagnation pressure
[ ] Static pressure [ ] Dynamic pressure

14. What happens to the lift produced by an airfoil if the angle of attack increases?

[ ] The lift remains constant
[ ] The lift increases linearly
[ ] The lift increases initially, but may decrease after a critical angle
[ ] The lift decreases exponentially

SECTION "B"

[6 Q. × 1 = 6 marks]

Fill in the Blank

15. The static and stagnation pressures of a fluid in a pipe are measured by a piezometer and a pitot tube to be 200 kPa and 210 kPa, respectively. If the density of the fluid is 550 kg/m3, the velocity of the fluid is _____.

16. With the similar diameter pipe system, which is larger: sudden contraction loss or sudden expansion loss _____.

17. As a non-Newtonian fluid, the common synthetic paint is an example of _____ or _____.

18. Surface tension of water decreases with increasing _____ and _____.

19. At moderate Reynolds numbers, the drag coefficient for a sphere is high comparaed with that at turbulent flow due to a phenomenon called _____.

20. The following divergence is also known as _____

$$\nabla \cdot V = 0$$