SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code : FM(15A01305) **Course & Branch**: B.Tech - CE

Year & Sem: II-B.Tech & I-Sem **Regulation:** R15

UNIT – V

Analysis of Pipe Flow and Laminar and Turbulent Flow in Pipes

1. Two parallel plates kept 75 mm a part have laminar flow of glycerine between them with a maximum velocity of 1 m/s. Calculate the discharge per metre width, the shear stress at the plates, the difference in pressure gradients at the plates and velocity at 15 mm from the plates. Take viscosity of glycerine as 8.35 poise. 10M
2. a) A shaft of 100 mm diameter rotates at 60 rpm in a 200 mm long bearing. Taking that the two surfaces are uniformly separated by a distance of 0.5 mm and taking linear velocity distribution in the lubricating oil having dynamic viscosity of 4 centipoises, find the power absorbed in the bearing. 5M

   b) A shaft 100 mm diameter runs in a bearing of 200 mm with a radial clearance of 0.025 mm at 30 rpm. Find the velocity of the oil, if the power required to overcome the viscous resistance is 183.94 watts. 5M
3. Using Hagen-poiseuille formula, derive an expression for the head loss in a pipe of diameter D and length L in terms of Reynolds number and velocity head. 10M
4. A pipe of diameter 20 cm and length 10^4 m is laid at a speed of 1 in 200. An oil of specific gravity 0.9 and viscosity 1.5 poise is pumped up at the rate of 20 lit/s. Find the head lost due to friction. Also calculate the power required to pump the oil. 10M
5. Determine the wall shearing stress in a pipe of diameter 100 mm which carries water. The velocities at the pipe center and 30 mm, from the pipe center are 2 m/s and 1.5 m/s respectively. The flow in pipe is given as turbulent. 10M
6. Find the head lost due to friction in a pipe of diameter 300 mm and 50 m, through which water is flowing at a velocity of 3 m/sec using (i) Darcy's formula (ii) Chezy's formula for which C=60. 10M
7. At a sudden enlargement of a water main from 240 mm to 280 mm diameter, the hydraulic gradient rises by 10 mm. Estimate the rate of flow. 10M

8. Derive the expression for loss of head due to friction in pipes. 10M
9. Derive the expression for loss of head due to sudden enlargement. 10M
10. a) Define Hydraulic gradient line and total energy line. 2M
    b) List out the different minor loss of energy. 2M
    c) Derive Darcy-weisbach equation. 2M
    d) Define laminar and turbulent flow with Reynold's number. 2M
    e) What are the loss of head at entrance and exit of pipe? 2M

Prepared by: **M. Muzaffar Ahmed and Y. Guru Prasad**.

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Analysis of Pipe Flow and Laminar and Turbulent Flow in Pipes

1. A flow is said to be laminar [ ]
   A) The fluid particles are move in zig-zag way B) The Reynolds number is high

C) The fluid particles are move parallel to the layer D) None of the above

2. For a laminar flow through a circular pipes [ ]

A) The maximum velocity = 1.5 times of average velocity

B) The maximum valocity = 2.0 time the average velocity

C) The maximum valocity = 2.0 time the average velocity

D) None of the above

3. The loss of pressure head for the laminar flow through pipes varies [ ]

A) As the square of velocity B) Directly as the velocity

C) As the inverse of velocity D) None of the above

4. For the laminarflow through a pipe, the shear stress over the cross-section [ ]

A) Varies inversly as the distance from the centre of pipe

B) Varies directly as the distance from the surface of pipe

C) Varies directly as the distance from the centre of the pipe

D) Remains constant over the cross-section

5. The velocity distribution in laminar flow through a circular pipe follow the [ ]

A) Parabolic law B) Linear law C) Logathemic law D) None of the above

6. Head loss in turbulent flow in pipe varies directly as the [ ]

A) Square root of velocity B) Velocity C) Square of velovity D) Cube of velocity

7. Velocity of fluid particles at the centre of pipe section is [ ]

A) Maximum B) Minimum C) Average D) r.m.s

8. Tranquil flow must always occurs [ ]

A) At normal depth B) Above the normal depth C) Below normaldepth D) Above critical depth

9. In laminar flow [ ]

A) Experiment is required for the simplest flow case B) Newton'slaw of viscosity is applied

C) Flow particles move in irregular path D) Viscosity of unimportant

10. For pipe flow, at constant diameter, head is proportional to [ ]

A) Flow B) $(Flow)^2$ C) $(flow)^3$ D) $(Flow)^{-1}$

11. The shear stress in a turbulent pipe is [ ]

A) Varies parabolically with radius B) Is constant over the pipe radius

C) Varies ccording to 1/7 the power law D) Is zero at centre and increased linearly to the wall

12. The pipe bend causing maximum hesd loss is [ ]

A) 30^0 bend B) 45^0 bend C) 60^0 bend D)90^0 bend

13. For pipes, laminar flow occurs when the Reynolds number is [ ]

A) Less than 2000 B) Between 2000 and 4000 C) More than 2000 D) More than 4000

14. Whaen a fluid flows in concentric circles, it is known as [ ]

A) Free circulation motion B) Free rotational motion C) Free sriral motion D) None of above

15. Seperation is caused by [ ]

A) Reduction of pressure to vapour pressure B) Reduction of pressure gradient to zero

C) An adverse pressure gradient D) The boundary layer thickness is reducing to zero

16. Pressure gradient in laminar motion along the flow directional is equal to [ ]

A) Velocity gradient B) Rate of change of velocity normal to the direction of flow

C) Surface tension cannot be neglected D) Surface tension be neglected

17. In laminar flow through a roundtube, the discharge varies [ ]

A) Linearly as the viscosity B) Inversely as the pressure drop

C) Linearly as the cube of the diameter D) Invesely as the viscosity

18. Friction factor for pipes deponds on [ ]

A) Rate of flow & density B) Viscosity C) Pipe roughness D) All the above

19. An ideal fluid is [ ]

A) Similarly to the perfect gas B) Frictionless and incompressible

C) Obey Newtons law of viscosity D) Satisfies continity equation

20. For transition flow, the Reynolds number varies [ ]

A) Less than 2000 B) More than 4000 C) Between 2000 & 4000 D) Less than 4000

21. The frictional head loss in a turbulent flow through a pipe varies [ ]

A) Directly as the average velocity.

B) Directly as the square of the average velocity.

C) Inversely as the square of the average velocity.

D) Inversely as the square of the internal diameter of the pipe.

22. The pressure drop in a pipe flow is directly proportional to the mean velocity. It can be deduced that the [ ]

A) Flow is laminar B) Flow is turbulent C) Pipe is smooth D) Pipe is rough

23. Two pipes systems can be said to be equivalent, when the quantities same are [ ]

A) Frictionless loss andflow B) Length and diameter C) Flow and length D) Length and flow

24. In pipe larger than 25 mm, carrying water, the laminer flow is [ ]

A) Very often exist B) Generally exist C) Rarely exist D) Unpredictable

25. Critical velocity is [ ]

A) Maximum attainable velocity B) Terminal velocity

C) Velocity when hydraulic jump isoccurs D) velocity above which flow ceases to be strean line

26. The stress-srain relation of the Newtoneon fluid is [ ]

A) Linear B) Parabolic C) Hyperbola D) Inerse type

27. In a turbulent flow [ ]

A) Flow particles flow in an orderly manner B) Momentum transfer is on a molecular only

C) Shear stress is larger than in similar laminar flow D) None of the above

28. Rain drops are spherical in shape because of [ ]

A) Viscosity B) Air resistance C) Atmospheric pressure D) Surface tension

29. Which of the following forces does not acts in case of fluids [ ]

A) Centrifugal force B) Tensile force C) Vibratory force D) Elastic force

30. Prandt's mixing length hypothesis is based on [ ]

A) Eddy viscosity B) Momentum exchange that occur due to random motion

C) Similarity of turbulent flow patren D) None of the above

31. The Darcy-Weisbach equation for loss of head is [ ]

A) $4.f.L.V^2/2g.d$ B) $f.L.V^2/2g.d$ C) $4.L.V^2/2g.d$ D) $4.f.L.V^2/2g.$

32. The Chezy's formula is [ ]

A) $V=C\sqrt{m}$ B) $V=\sqrt{mi}$ C) $V=C\sqrt{mi}$ D) $V=C\sqrt{i}$

33. The formula for Reynolds number is [ ]

A) Vd/μ B) $\rho V/\mu$ C) ρVd D) $\rho Vd/\mu$

34. The loss of head due to sudden enlargement is [ ]

A) $(V_1-V_2)/2g$ B) $(V_1-V_2)^2/2g$ C) $(V_1-V_2)^2/g$ D) $(V_1-V_2)^2/2$

35. The loss of head at the exist of the pipe is [ ]

A) $1.0 \times V^2/2g$ B) $2.5 \times V^2/2g$ C) $0.5 \times V^2/2g$ D) $1.5 \times V^2/2g$

36. The loss of head at the entrance of the pipe is [ ]

A) $1.0 \times V^2/2g$ B) $2.5 \times V^2/2g$ C) $0.5 \times V^2/2g$ D) $1.5 \times V^2/2g$

37. Hydraulic grade line for any flow system as compared to energy line is [ ]

A) Above B) Below C) At same level D) Uncertain

38.Total energy line for any flow system as compared to Hydraulic grade line is [ ]

A) Above B) Below C) At same level D) Uncertain

39. Flow through branched pipes can be solved by the following equations [ ]

A) Continuity equation B) Bernoull's equation C) Darcy-Weisbach equation D) All the above

40. Which one of the following statements is appropriate for the free surface, the hydraulic gradient line and energy gradient line in an open channel flow [ ]

A) Parallel to each other but they are different lines B) All coinciding

C) Such that only the first two coincide D) Such that they are all inclined to each Other

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