Subject:

Fluid Mechanics &machinery

(22445)

SYLLABUS

Chapter No.	Name of chapter	Marks With Option
1	Properties of fluid & Fluid Pressure & Pressure Measurement	08
2	Fluid Flow	12
3	Flow Through Pipes	12
4	Impact of jet	08
5	Hydraulic Turbines	14
6	Pumps	16
	Total Marks :-	70

BOARD THEORY PAPER PATTERN FOR FMM(22445)

Q.1		**Attempt any FIVE** **5*2=10**
	a)	Properties of fluid & Fluid Pressure & Pressure Measurement
	b)	Properties of fluid & Fluid Pressure & Pressure Measurement
	c)	Flow Through Pipes
	d)	Flow Through Pipes
	e)	Hydraulic Turbines
	f)	Pumps
	g)	Pumps
Q.2		**Attempt any THREE** **3*4=12**
	a)	Properties of fluid & Fluid Pressure & Pressure Measurement
	b)	Properties of fluid & Fluid Pressure & Pressure Measurement
	c)	Fluid Flow
	d)	Fluid Flow
Q.3		**Attempt any THREE** **3*4=12**
	a)	Flow Through Pipes
	b)	Flow Through Pipes
	c)	Flow Through Pipes
	d)	Impact of jet
	e)	Impact of jet
Q.4		**Attempt any THREE** **3*4=12**
	a)	Hydraulic Turbines
	b)	Hydraulic Turbines
	c)	Hydraulic Turbines
	d)	Pumps

	e)	Pumps
Q.5		**Attempt any TWO** **2*6=12**
	a)	Fluid Flow
	b)	Flow Through Pipes
	c)	Impact of jet
Q.6		**Attempt any TWO** **2*6=12**
	a)	Hydraulic Turbines
	b)	Pumps
	c)	Pumps

CLASS TEST - I
PAPER PATTERN

Syllabus:-

Unit No.	Name of the Unit	Course Outcome (CO)
1	**Properties of fluid & Fluid Pressure & Pressure Measurement**	**CO-445.01**
2	**Fluid Flow**	**CO-445.02**
3	**Flow Through Pipes**	**CO-445.03**

Q.1	**Attempt any FOUR 4*2=8Marks**	**Course Outcome (CO)**
a)	Properties of fluid & Fluid Pressure & Pressure Measurement	CO-445.01
b)	Properties of fluid & Fluid Pressure & Pressure Measurement	CO-445.01
c)	Fluid Flow	CO-445.02
d)	Fluid Flow	CO-445.02
e)	Flow Through Pipes	CO-445.03
Q.2	**Attempt any THREE 3*4= 12Marks**	
a)	Properties of fluid & Fluid Pressure & Pressure Measurement	CO-445.01
b)	Flow Through Pipes	CO-445.03
c)	Fluid Flow	CO-445.02
d)	Flow Through Pipes	CO-445.03

CLASS TEST - II
PAPER PATTERN

Syllabus:-

Unit No.	Name of the Unit	Course Outcome (CO)
4	**Impact of jet**	**CO-445.04**
5	**Hydraulic Turbines**	**CO-445.05**
6	**Pumps**	**CO-445.06**

Q.1	**Attempt any FOUR** **4*2=6Marks**	**Course Outcome (CO)**
a)	Impact of jet	CO-445.04
b)	Hydraulic Turbines	CO-445.05
c)	Pumps	CO-445.06
d)	Hydraulic Turbines	CO-445.05
e)	Pumps	CO-445.06
Q.2	**Attempt any THREE** **3*4= 12Marks**	
a)	Impact of jet	CO-445.04
b)	Hydraulic Turbines	CO-445.05
c)	Pumps	CO-445.06
d)	Pumps	CO-445.06

COURSE OUTCOME (CO)

COURSE:- Fluid Mechanics &Machinery (22445)

PROGRAMME: - ALL

CO.NO	Course Outcome
CO-445.1	Use Manometer and Bourdons gauge to measure pressure
CO-445.2	Use flow meters to measure the rate of flow
CO-445.3	Maintain flow through pipe
CO-445.4	Maintain jet of impact on various types of vanes for optimum efficiency
CO-445.5	Maintain Hydraulic turbines
CO-445.6	Maintain hydraulic pumps

1. Properties of fluid & Fluid Pressure & Pressure Measurement

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Position in Question Paper **Total Marks-12**

Q.1. a) 2-Marks
b) 2-Marks
Q.2. a) 4-Marks
b) 4-Marks

Descriptive Question

1. List out the various measuring devices used for measuring fluid pressure.
2. Calculate pressure head of Kerosene of specific gravity 0.81 and carbon tetra chloride of specific gravity 1.6, if equivalent pressure head of water is 100 m.
3. Compare the physical properties of water with mercury at atmospheric condition on the basis of: (i) Kinematic viscosity (ii) Surface tension (mention value)
4. A rectangular plate 0.6 m wide and 1.2 m deep lies within a water body such that its plane is inclined at 45° to the horizontal and the top edge is 0.70 m below the water surface. Determine the total pressure force on one side of the plate and the location of the center of pressure.
5. Define Dynamic Viscosity and Kinematic Viscosity.
6. Convert height of 760 mm of mercury into height of water column.
7. A vertical plate 3 m × 2 m is immersed in water in such a way that, 2 m edge of plate is parallel to and at a depth of 1.5 m below free water surface. Calculate total pressure and depth of center of pressure.
8. A circular plate 3 m diameter is immersed in water in such a way that its greatest and least depth below the free surface are 4 m and 1.5 m respectively. Determine the total pressure and position of centre of pressure.
9. A left limb of a simple U-tube mercury manometer is connected to a pipe in which a fluid of specific gravity 0.9 is flowing. The center of the pipe is 12 cm below the

level of mercury in the right limb. Find the pressure of fluid in the pipe if the difference of mercury level in the two limbs is 20 cm.

10. Define Density and Specific gravity.

11. Define fluid pressure intensity and pressure head.

12. Explain Bourdon pressure gauge with a neat sketch.

13. Define surface tension and capillarity.

14. Explain a differential manometer with a neat sketch.

15. Define specific gravity and specific volume.

16. Define total pressure and centre of pressure.

17. Describe the procedure of pressure measurement using simple U-tube manometer.

18. Enlist types of manometers and explain any one of them with neat sketch.

19. Derive the equation for total pressure on an inclined immersed surface.

20. Define atmospheric pressure, gauge pressure and absolute pressure. State relationship between them.

21. Define:

(i) Specific gravity (ii) Mass density

(iii) Surface tension (iv) Specific volume

22. Define:

1) Atmospheric pressure 2) Gauge pressure

3) Absolute zero pressure 4) Vacuum pressure

MCQ Question

(Total number of Question=Marks*3=8*3=24)

1. What is an ideal fluid?

a. A fluid which has no viscosity
c. fluid which has surface tension
b. fluid which is compressible
d. All of the above

2. Newton's law of viscosity states that

a. the shear stress applied to the fluid is directly proportional to the velocity gradient(du/dy)
b. the shear stress applied to the fluid is inversely proportional to the velocity gradient(du/dy)
c. the shear stress applied to the fluid is directly proportional to the specific weight of the fluid
d. the shear stress applied to the fluid is inversely proportional to the specific weight of the fluid

3. Which one of the following is the unit of mass density?

a. **kg / m3**
c. kg = m
b. kg /m2
d. kg = ms

4. The specific gravity of a liquid has

a. the same unit as that of mass density
b. the same unit as that of weight density
c. the same unit as that of specific volume
d. no unit

5. Which one of the following is not a unit of dynamic viscosity

a. Pa-s

6. If a person studies about a fluid which is at rest, what will you call his domain of study?

a. Fluid Mechanics
c. Fluid Kinematics
b. Fluid Statics
d. Fluid Dynamics

7. Which one of the following is the correct relation between compressibility β andBulk Modulus k

a. β = k
c. β = 2k
b. β = 1/k
d. β = k/2

8. Specific weight of water in SI units is equal to.....

a. 1000 N/m3
c. 9810 N/m3
b. 10000 N/m3
d. 9.8 x 106 N/m

9. Surface tension has the units of.....

a. force per unity area
c. Force per unit volume
b. Force per unit length
d. None of the above

10. The Pascal law states that liquid at rest applies pressure at a point is _____ in all directions.

a. Same
c. Not matching
b. Un-same
d. Matching but not equal

11. Pressure of 1 atm = _____Pa

a. 1.013 x 10 -5 Pa
c. 1.013 x 10 5 Pa
b. 1.013 x 10 3 Pa
d. 1.013 x 10 -3 Pa

12. Bourdon tube pressure gauge measures

a. Low pressures
c. Low as well as high pressures
b. High pressures
d. none

13. Differential manometer is used to measure

a. Pressure in pipes, channels etc.
b. Atmospheric pressure
c. Very low pressure

d. Difference of pressure between two points

14. Inclined single column manometer is useful for which of the pressure

a. Small
c. High
b. Medium
d. None

15. Which of the following manometer has highest sensitivity

a. U-tube with water
c. U-tube with mercury
b. inclined U-tube
d. micro-manometer with water

16. The pressure measured with the help of a pressure gauge is called

a. Atmospheric pressure
c. Absolute pressure
b. Gauge pressure
d. Mean pressure

17. The total pressure on a horizontally immersed surface is (where w = Specific weight of the liquid, A = Area of the immersed surface, and x = Depth of the centre of gravity of the immersed surface from the liquid surface)

a. wA
c. wAx
b. wx
d. wA/x

18. A water tank contains 1.3 m deep water. The pressure exerted by the water permetre length of the tank is

a. 2.89 kN
c. 9.28 kN
b. 8.29 kN
d. 28.9 kN

19. The centre of pressure acts _____ the centre of gravity of immersed surface.

a. At
c. Below
b. Above
d. None of these

20. The point at which the resultant pressure on an immersed surface acts, is known as

a. Centre of gravity
c. Centre of pressure
b. Centre of depth
d. Centre of immersed surface

21. What type of liquids is measured using a manometer?

a. Medium Liquids
c. Heavy and light liquid
b. Heavy Liquids
d. Light Liquid

22. Which device is popularly used for measuring the difference of low pressure?

a. U-tube Differential Manometer

b. Inverted U-tube Differential Manometer

c. Vertical Single column manometer

d. Inclined Single column manometer

23. Atmospheric pressure held in terms of water column is .....

a. 7.5 m
b. 9.81 m
c. 8.5 m
e. 10.30 m

24. The bulk models of elasticity with increases in pressure .....

a. **Increases**
c. Remain constant
b. Decreases
d. Unpredictable

2. Fluid Flow

Position in Question Paper **Total Marks-18**

Q.2. c) 4-Marks
d) 4-Marks
Q.3.a) 4-Marks
Q.5.a) 6-Marks

Descriptive Question

1. Explain pressure and velocity variation at the inlet and the vena-contracta of orifice.
2. Explain with neat sketch the procedure for measuring velocity in pipe using pitot tube.
3. Define steady and unsteady flow.
4. Define rate of flow (Discharge). Write continuity equation.
5. State and explain Bernoulli's theorem with assumptions made.
6. Explain working principle, construction of pitot tube. How pitot tube is used for measuring local velocity of flowing fluid?
7. Water flows down an inclined tapering pipe 45 m long at a slope of 1 in 10. The areas at the upper and lower ends of pipe are 8 m2 and 3 m2 respectively. If the velocity at lower end is 4.5 m/s and the pressure at upper end is 100 kPa. Calculate the pressure at the lower end and rate of flow through pipe.
8. State the types of fluid flow.
9. Describe 'Continuity Equation'.
10. Explain with neat sketch principle of working of orifice meter.
11. A horizontal venturimeter 160 mm □ 80 mm is used to measure the flow of an oil of specific gravity 0.8. Determine the deflection of the oil-mercury gauge, if the discharge of the oil is 50 litres/s. Take co-efficient of venturimeter as 1.
12. Explain construction and working of 'Venturimeter'.

13. The discharge through an horizontal trapping is 0.06 m3/s. The diameter at the inlet and outlet are 250 mm & 200 mm respectively. If the water enters the pipe at a pressure of 9.81 bar, calculate the outlet pressure.

14. A pipe carrying water has a 30 cm × 15 cm ven-turimeter, which is positioned inclined at 30° to the horizontal. The flow is upwards. The converging cone is 45 cm in length and the Cd of the meter is 0.98. A differential U-tube manometer with mercury as indicating fluid is connected to the inlet and to the throat and shows a differential column height of 30 cm.

(i) Calculate the discharge of the pipe.

(ii) If the pressure in the inlet section is 50 kPa determine the pressure at the throat.

(iii) Find the head loss in the converging section of the venturimeter.

15. Interpret on the flow of fluid as turbulent or laminar in following situations:

(i) Viscous liquid like engine oil travelling on a smooth surface.

(ii) Water falling from top of a water fall.

(iii) Glycerine oil travelling on a smooth surface kitchen floor.

(iv) Water flowing at high pressure through sewage pipe.

16. Compare the physical properties of water with mercury at atmospheric condition on the basis of: (i) Kinematic viscosity (ii) Surface tension (mention value)

MCQ Question

(Total number of Question=Marks*3=12*3=36)

1. What type of flow can be taken for granted in a pipe of a uniform cross-section?

a. unsteady
c. **uniform**
b. steady
d. uniform non-uniform

2. The continuity equation is based on the principle of

a. conservation of mass
c. conservation of energy
b. conservation of force
d. conservation of momentum

3. Which is the cheapest device for measuring flow / discharge rate

a. Venturimeter
c. Orifice meter
b. Pitot tube
d. None of the mentioned

4. Orifice meter is used to measure

a. Discharge
c. Velocity at a point
b. Average velocity
d. Pressure at a point

5. Which of the following is not an application of Bernoulli's equation?

a. Venturi meter
c. Anaemometer
b. Orifice
d. Pitot tube

6. Velocity at a point in pipe flow may be measured by installing

a. a wall tap
c. pitot tube
b. Venturimeter
d. Rotameter

7. The cylindrical portion of short length, which connects converging and diverging section of venturimeter, is called as

a. diffuser
c. throat
b. connector
d. manometer tube

8. Venturimeter consists of short converging conical tube which has a total inclination angle of

a. 1 ± 1degree
b. 21 ± 1degree

c. 30 ± 1degree
d. 60 ± 1degree

9. What is the relationship between Orificemeter diameter and pipe diameter

a. Orificemeter diameter is 0.5 times the pipe diameter
b. Orificemeter diameter is one third times the pipe diameter
c. Orificemeter diameter is one fourth times the pipe diameter
d. Orificemeter diameter is equal to the pipe diameter

10. Which of the following is used to measure the discharge

a. current meter
c. pitot tube
b. venturimeter
d. hotwire anemomete

11. For measuring flow by a venturimeter, if should be installed in

a. vertical line
c. **inclined line with upward flow**
b. horizontal line
d. in any direction and in any location

12. Bernoulli's equation cannot be applied when the flow is

a. rotational
c. unsteady
b. turbulent
d. all of the above

13. Relative density of mercury is

a. 1
c. **13.6**
b. 9.8
d. 1000

14. On which equation of Bernoulli is applicable?

a. Irrotational flow
c. Inviscid, incompressible flow
b. Viscous flow
d. Compressible flow

15. A1V1 = A2V2, this equation is called

a. continuity equation
c. volume equation
b. Bernoulli's equation
D. area equation

16. In vena contracta effect, the diameter of jet is

a. greater than diameter of hole
c. equal to diameter of hole
b. lesser than diameter of hole
d. two times the diameter of hole

17. The Bernoulli equation can be written in terms of heights called

a. heads
c. lengths
b. columns
d. None of these

18. Pitot-static tubes measure fluid velocity by converting velocity into

a. potential energy
c. pressure
b. Kinetic energy
d. None of these

19. The unit of Discharge is

a. **Lit/sec**
c. Both A and B
b. kg/s
d. None of these

20. Total energy line (T.E.L.) represents the sum of

a. Pressure head and kinetic head
b. Kinetic head and datum head
c. Pressure head and datum head
d. Pressure head,kinetic head and datum head

21. Bernoulli's equation for steady, frictionless, continuous flow states that the _____ at all sections is same.

a. Total pressure
c. Velocity head
b. Total energy
d. None of these

22. The exit cone angle in case of a standard venturimeter is _____ the entrance cone angle.

a. Smaller than
c. Equal to
b. Greater than
d. Either A or B

23. Power loss in an orificemeter is _____ that in a venturimeter.

a. Less than
c. **More than**
b. Same as
d. Data insufficient,

24. A venturimeter measures the

a. Velocity head
c. Point velocity
b. Pressure
d. **None of these**

25. The most serious disadvantage of an orificemeter is that

a. It is not very accurate
b. It is very costly
c. **Most of the pressure drop is not recoverable**
d. It is not suitable for measuring gas flow

26. What is the co-efficient of contraction, if a fluid jet discharging from a 50 mm diameter orifice has a 40 mm diameter at its vena-contracta?

a. 0.64
c. 0.32
b. 1.65
d. 0.94

27. Fluid flow at increasing rate through a diverging pipe is an example of _____ flow.

a. Steady uniform
c. Steady non-uniform
b. Non-steady uniform
d. Non-steady non-uniform

28. Gradually varying fluid flow is an example of _____ flow.

a. Non-steady uniform
c. Steady uniform
b. Non-steady non-uniform
d. Steady non-uniform

29. A flow in which the volume of a fluid and its density does not change during the flow is called _____ flow.

a. Incompressible
c. Viscous
b. Compressible
d. None of these

30. The value of coefficient of discharge is _____ the value of coefficient of velocity.

a. Less than
c. More than
b. Same as
d. None of these

31. The length of the divergent cone in a Venturimeter is _____ that of the convergent cone.

a. Equal to
c. Three to four times
b. Double
d. Five to six times

32. The actual velocity at vena-contracta for flow through an orifice from a reservoir is given by

a. Cv . √(2gH)
c. Cd . √(2gH)
b. Cc . √(2gH)
d. Cv . Va

33. Each term of the Bernoulli's equation written in the form, $P/\rho + g/gc .Z + v^2/2gc$ = constant , represents the total energy per unit

a. Mass
c. Specific weight
b. Volume
d. None of these

34. The discharge through a venturimeter depends upon

a. Pressure drop only
c. Co-efficient of contraction only
b. Its orientation
d. None of these

35. Vena-contracta formed during flow of a liquid through an orificemeter has

a. Minimum liquid cross-section
b. More diameter compared to orifice diameter
c. Minimum velocity of fluid stream
d. None of these

36. _____ isused for measuring the static pressure exerted on the wall by a fluid flowing parallel to the wall in a pipeline.

a. Venturimeter
c. Pitot tube
b. Pressure gauge
d. Orificemeter

3. Flow through Pipes

Position in Question Paper **Total Marks-18**

Q.1. c) 2-Marks
d) 2-Marks
Q.3.b) 4-Marks
c) 4-Marks
Q.5.b) 6-Marks

Descriptive Question

1. Describe Chezy's equation for head loss due to friction.
2. Find the maximum power that can be transmitted by a power station through a hydraulic pipe of 3 kilometers long and 200 mm diameter. The pressure of water at the power station is 1500 kPa. Take f = 0.01
3. Calculate the power transmitted by 250 mm diameter pipe of length 500 m carrying water under a head of 100 m. Take friction factor 0.0015.
4. Find loss of head when a pipe of diameter 30 cm is suddenly enlarged to a diameter of 40 cm. The rate of flow of water through pipe is 300 liters/second.
5. Enlist various minor losses in flow through pipes. Write equations of any four losses.
6. Write Darcy's and Chezy's equation for frictional head losses and write meaning of each term in it.
7. Derive equation for power transmission through pipe of diameter'd' and length 'L' through which a water of constant head 'H' is flowing with a velocity of 'v'.
8. Explain the terms involved in Darcy's equation, Chezy's equation for frictional loss, also show that for a given total head H, the power transmitted through a pipeline connected to a reservoir is maximum when the loss of head due to friction. hf = H/3 (minor losses can be neglected).
9. The population of a city is 800000 and it is to be supplied with water from a reservoir 6.4 km away. Water is to be supplied at the rate of 140 litres per head per day and half the supply is to be delivered in 8 hours. The loss of head due to friction in the pipeline is 60 m. Find the diameter of the pipe. Take f = 0.04.

10. Explain the causes of water hammer in pipes and the procedure for reducing its effect.

11. State laws of fluid friction for laminar flow.

12. Define the terms:

(i) Hydraulic gradient line

(ii) Total Energy line

MCQ Question

(Total number of Question=Marks*3=12*3=36)

1. What is Darcy-Weisbach formula for heat loss due to friction? Where, f = Darcy's coefficient of friction

a. hf = (f l V2) / (g d)
c. hf = (4 f l V2) / (2 g d)
b. hf = (f l V2) / (2 g d)
d. hf = (16 f l V2) / (2 g d)

2. Minor losses occur due to

a. sudden enlargement in pipe
c. bends in pipe
b. sudden contraction in pipe
d. all of the above

3. The head loss through fluid flowing pipe due to friction is

a. the minor loss
c. both a. and b.
b. the major loss
d. none of the above

4. What is the correct formula for loss at the exit of a pipe?

a. hL = 0.5 (V2 / 2g)
c. hL = (2 V2 / g)
b. hL = (V2 / 2g)
d. hL = (4 V2 / g)

5. Which one of the following is a major loss?

a. frictional loss
c. entry loss
b. shock loss
d. exit loss

6. The frictional resistance for fluids in motion is

a. proportional to the velocity in laminar flow and to the square of the velocity in turbulent flow
b. proportional to the square of the velocity in laminar flow and to the velocity in turbulent flow
c. proportional to the velocity in both laminar flow and turbulent flow
d. proportional to the square of the velocity in both laminar flow and turbulent flow

7. Energy gradient line takes into consideration

a. potential and kinetic heads only

b. potential and pressure heads only

c. kinetic and pressure heads only

d. potential, kinetic and pressure heads

8. Hydraulic gradient line takes into consideration

a. potential and kinetic heads only

b. **potential and pressure heads only**

c. kinetic and pressure heads only

d. potential, kinetic and pressure heads

9. Which of the following is true?

a. HGL will never be above EGL

b. HGL will never be under EGL

c. HGL will never coincide with EGL

d. HGL will may or may not be above EGL

10. On which of the factors does the co-efficient of bend in a pipe depend?

a. angle of bend and radius of curvature of the bend

b. angle of bend and radius of the pipe

c. radius of curvature of the bend and pipe

d. radius of curvature of the bend and pipe and angle of bend

11. What is the total loss developed in a series of pipes?

a. Sum of losses in each pipe only

b. Sum of local losses only

c. Sum of local losses plus the losses in each pipe

d. Zero

12. Which among the following is not a loss that is developed in the pipe?

a. Entry

b. Exit

c. Connection between two pipes

d. Liquid velocity

13. How do we determine the total discharge through parallel pipes?

a. Add them.
c. Multiply them
b. Subtract them
d. Divide them

14. Where is a water hammer developed?

a. Reservoir
c. Turbine blades
b. Penstock
d. Pipe line

15. Maximum efficiency of transmission of power through a pipe is

a. 25%
c. 33.3%
b. 66.66%
d. 50%

16. Power transmitted through a pipe is given by where w = specific weight of the fluid flowing through pipe Q = discharge, m3/s

a. wQH
c. wQ(H - HL)
b. wQHL
d. wQ(H + HL

17. Power transmitted through a pipe is maximum when Where H = total headsupplied HL = head loss due to friction

a. HL = H/2
c. HL = H/4
b. HL = H/3
d. HL = H

18. A compound pipe is required to be replaced by a new pipe. The two pipes aresaid to be equivalent, if

a. Length of both the pipes is same
b. Diameter of both the pipes is same
c. Loss of head and discharge of both the pipes is same
d. Loss of head and velocity of flow in both the pipes is same

19. Which one of the following is correct?

a. Darcy-Weisbach's formula is generally used for head loss in flow through both pipes and open channels
b. Chezy's formula is generally used for head loss in flow through both pipes and open channels
c. Darcy-Weisbach's formula is generally used for head loss in flow through both pipes and Chezy's formula for open channels
d. Chezy's formula is generally used for head loss in flow through both pipes and Darcy-Weisbach's formula for open channels

20. The liquid flowing through a series of pipes can take up_____

a. pipes of different diameters
c. single pipe only
b. pipes of the same diameters only
d. short pipes only

21. Minor losses do not make any serious effect in

a. short pipes
c. both pipes
b. long pipes
d. cannot say

22. The hydraulic mean depth or the hydraulic radius is the ratio of

a. Area of flow and wetted perimeter
b. Wetted perimeter and diameter of pipe
c. Velocity of flow and area of flow
d. None of these

23. The hydraulic mean depth for a circular pipe of diameter (d) is

a. d/6
c. d/2
b. d/4
d. d

24. According to Chezy's formula, the discharge through an open channel is (where A = of flow, C = Chezy's constant, m = Hydraulic mean depth, and i = Uniform slope in bed)

a. $A \times \sqrt{(m \times i)}$
c. $AC \times \sqrt{(m \times i)}$
b. $C \times \sqrt{(m \times i)}$
d. $mi \times \sqrt{(A \times C)}$

25. Water hammer is developed in which power plant?

a. Solar
c. Hydro
b. Nuclear
d. Wind

26. The liquid flowing through a series of pipes can take up_____

a. Pipes of different diameters
c. Single pipe only
b. Pipes of the same diameters only.
a. d Short pipes only

27. The total head loss for the system is equal to_____

a. Pipe length
c. Width of the reservoir
b. Pipe diameter
d. **Height difference of reservoirs**

28. Which among the following is not a loss that is developed in the pipe?

a. Entry
c. Connection between two pipes
b. Exit
d. **Liquid velocity**

29. Which among the following is the correct formula for head loss?

a. Z1-Z2
b. C

c. T2-T1
d. S2-S1

30. The pipe diameter is _____

a. Directly proportional to fluid density
b. Directly proportional to mass flow rate
c. Inversely proportional to mass flow rate
d. Directly proportional to fluid velocity

31. The vertical intercept between EGL and HGL is equal to

a. pressure head
b. potential head
c. kinetic head
d. Piezometric head

32. Which property of the fluid accounts for the major losses in pipes?

a. density
b. specific gravity
c. compressibility
d. viscosity

33. The frictional resistance for fluids in motion is

a. inversely proportional to the square of the surface area of contact
b. inversely proportional to the surface area of contact
c. proportional to the square of the surface area of contact
d. **proportional to the surface area of contact**

34. The frictional resistance for fluids in motion varies

a. slightly with temperature for both laminar and turbulent flows
b. considerably with temperature for both laminar and turbulent flows
c. slightly with temperature for laminar flow and considerably with temperature for turbulent flow
d. **considerably with temperature for laminar flow and slightly with temperature for turbulent flow**

35. Which one of the following is correct?

a. Darcy-Weisbach's formula is generally used for head loss in flow through both pipes and open channels

b. Chezy's formula is generally used for head loss in flow through both pipes and open channels
c. **Darcy-Weisbach's formula is generally used for head loss in flow through both pipes and Chezy's formula for open channels**
d. Chezy's formula is generally used for head loss in flow through both pipes and Darcy-Weisbach's formula for open channels

36. A liquid flows through pipes 1 and 2 with the same flow velocity. If the ratio of their pipe diameters d1: d2 be 3:2, what will be the ratio of the head loss in the two pipes?

a. 3: 2
c. 2:3
b. 9:4
d. 4:9

4. Impact of jet

Position in Question Paper **Total Marks-14**

Q.3.d) 4-Marks
e) 4-Marks
Q.5.c) 6-Marks

Descriptive Question

1. Obtain an expression for impact of jet of a liquid on a fixed curved plate when the jet strikes at the centre of the curved plate.
2. A jet of water of diameter 7.5 cm moving with a velocity of 25 m/s strikes a fixed plate in such a way that the angle between the jet and plane is 60º. Find the force exerted by the jet on the plate,

   (i) in the direction normal to the plane.

   (ii) in the direction of the jet.
3. A jet of water 50 mm in diameter strives on a fixed plate normally with a velocity of 25 m/s. Find the force exerted on flat plate.
4. Derive an expression for force exerted by the jet on stationary inclined flat plate in direction of jet.
5. A Jet of water strikes on series of cup shaped vanes which deflect it through 165º. If the velocity of jet is that corresponding to a head of 40 m and velocity of vanes is such that the efficiency is maximum. Find the work done on vane per kg of water.
6. Explain the meaning of ‘Impact of Jet’.
7. Derive expression for force exerted by jet on fixed symmetrical curved blade, when jet strikes the blade normally.
8. A jet of water of diameter 10 cm strikes a flat plate normally with a velocity of 15 m/s. The plate is moving with a velocity of 6 m/s in the direction of jet and away from it. Find:

   (i) Force exerted by the jet on the plate.

   (ii) Work done by the jet on the plate per second.
9. A jet of water 50 mm in diameter under a constant head of 50 m impinges on a fixed flat plate normally. Find force exerted by the jet on the plate. Take co-efficient of velocity is 0.95.

10. Explain the expression of force exerted by the impact of jet on an inclined fixed plate and also draw a neat sketch for the same. Also find the work done.

11. A jet of water moving at 20 m/s impinges on a symmetrical curved vane shaped to deflect the jet through 120° (that is the vane angle θ and φ are equal to 30°). If the vane is moving at 5 m/s, find the angles of the jet so that there is no shock at inlet. Also determine the absolute velocity of exit in magnitude and direction, and the work done.

12. Explain velocity diagram for the jet striking tangentially at the tips of a moving an unsymmetrical curved vanes.

MCQ Question

(Total number of Question=Marks*3=8*3=24)

1. The force analysis on a curved vane is understood using_____

a. Velocity triangles
c. Plate dimensions
b. Angle of the plate
d. Vane angles

2. Jet propulsion works on the principle of_____

a. Newton's first law
c. **Thermodynamic properties**
b. Newton's third law
d. Newton's second law

3. How is absolute velocity at inlet denoted?

a. V
c. C
b. V1
d. v

4. The relative velocity is obtained by the equation_____

a. u – V1
c. u*V1
b. V1
d. u/V

5. The efficiency of the vane is given by_____

a. **1-V22/ V12**
c. V22/ V12
b. 1-(V22/ V12)
d. 1- V12

6. A jet strikes a curved plate at its _____

a. Sides
c. **Centre**
b. Surface
d. Does not strike

7. Jet propulsion of ship is less efficient than screw propeller due to_____

a. Pressure
c. **Frictional losses**
b. Temperature
d. Wear and tear

8. Force exerted by a jet on a stationery plate happens in how many cases?

a. **3 cases**
c. 1 case
b. 2 cases
d. Nil

9. Force exerted by a jet on a moving plate happens in how many cases?

a. **3 cases**
c. 1 case
b. 2 cases
d. Nil

10. In a stationery vertical plate, the jet after striking the plate will move _____

a. In opposite direction
c. Perpendicular to the plate
b. **Along the plate**
d. Parallel to the plate

11. At what angle does the jet deflect after striking a stationery vertical plate?

a. 30
c. **90**
b. 60
d. 0

12. The velocity component after striking the surface will be_____

a. One
c. Infinity
b. **Zero**
d. Negative

13. Which among the following is the formula for Force when it strikes the plate?

a. **pav2**
c. pa
b. pav
d. maE

14. The mass of water per sec striking the plate is_____

a. pav2
c. pa
b. **pav**
d. maE

15. Which among the following is formula for force when it acts along the direction of flow?

a. **pav2Sin2θ**
c. pa Sin2θ
b. pav Sin2θ
d. maE Sin2θ

16. Which among the following is a formula for force when it acts perpendicular to the direction of flow?

a. **pav2 SinθCosθ**
c. pa Sin2θ
b. pav Sin2θ
d. maE Sin2θ

17. A jet strikes a curved plate at its _____

a. Sides
c. **Centre**
b. Surface
d. Does not strike

18. A jet after striking a smooth plate comes out with a _____ velocity.

a. Increased
c. **Same**
b. Decrease
d. Zero

19. The ratio of the normal force of jet of water on a plate inclined at an angle θ as compared to that when the plate is normal to the jet, is

a. 1
b. ½

c. 2
d. $\sqrt{2}$

20. Maximum efficiency of a series of vertical plates is
a. 66.67%
c. **50%**
b. 33.33%
d. 100%

21. Force on a flat stationary plate is
a. Velocity of jet before impact – velocity after impact
b. Difference in velocities of jet in the direction normal to plate
c. Mass of water x (difference in velocities of jet)
d. **Mass of striking water x (velocity before impact in the direction normal to plate-velocity fter impact in the direction normal to plate).**

22. Relative velocity is
a. The difference between two velocities
b. The difference between the higher velocity and average velocity
c. Average velocity
d. Vector difference of two velocities

23. The force exerted by a jet of water impinging normally on a plate which due to the impact of jet, moves in the direction of jet with a velocity v is
a. [wa (V - v)]/2g
c. [wa $(V - v)^2$]/2g
b. [wa (V - v)]/g
d. **[wa $(V - v^2)$]/g**

24. If the pressure remains a constant, then _____
a. $V_{r1} > V_{r2}$
c. $\mathbf{V_{r1} = V_r}$
b. $V_{r1} < V_{r2}$
d. V_{r1} is a zero

5. Hydraulic Turbines

Position in Question Paper **Total Marks-20**

Q.1.e) 2-Marks
Q.4.a) 4-Marks
b) 4-Marks
c) 4-Marks
Q.6.a) 6-Marks

Descriptive Question

1. Draw inlet and outlet velocity triangles for bucket in Pelton wheel with the meaning of terms.
2. A Pelton wheel develops 2000 kW under a head of 100 meters' and with an overall efficiency of 85%. Find the diameter of the nozzle if the co-efficient of velocity for the nozzle is 0.98.
3. Explain phenomenon of cavitation in reaction turbines.
4. Define draft Tube. State the types of draft tubes. Explain any one in detail with sketch.
5. Draw a neat labelled sketch of Kaplan turbine and explain its unique feature.
6. A Pelton wheel having semi-circular bucket is 1 m in diameter. Pressure head at nozzle when it is closed is 15 bar. The discharge when nozzle is open is 3.5 m3/min. If speed is 600 RPM, calculate power developed and hydraulic efficiency.
7. Classify the hydraulic turbines.
8. Explain:

   (i) Classification of Hydraulic Turbines

   (ii) Importance of draft tube in reaction turbine.
9. Explain working principle, construction and working of Pelton wheel turbine with neat labeled diagram.
10. Differentiate between impulse turbine and reaction turbine
11. A Pelton wheel has a mean bucket speed of 12 m/s and is supplied with water at a rate of 750 litres per second under a head of 35 m. If the bucket deflects the jet through an angle of 160°, find the power developed by the turbine and its hydraulic efficiency. Take the coefficient of velocity as 0.98. Neglect friction in

the bucket. Also determine the overall efficiency of the turbine, if its mechanical efficiency is 80%.

12. Draw a characteristic curve of a Kaplan turbine showing part load performance.

13. State the name of turbine for following conditions:

(i) High head, minimum discharge

(ii) Low head, maximum discharge

(iii) Specific speed varying for 60 to 400 metric units

(iv) Medium head and discharge.

14. State the function of each element of a hydroelectric power plant, with the help of a neat sketch.

15. State the function of draft tube and name any two types of draft tube.

MCQ Question

(Total number of Question=Marks*3=14*3=42)

1. Hydraulic energy is converted into another form of energy by hydraulic machines. What form of energy is that?

a. Mechanical Energy
b. Electrical Energy
c. Nuclear Energy
d. Elastic Energy

2. Which principle is used in Hydraulic Turbines?

a. Faraday la
b. Newton's second law
c. Charles law
d. Braggs law

3. Buckets and blades used in a turbine are used to:

a. **a. Alter the direction of water**
b. Switch off the turbine
c. To regulate the wind speed
d. To regenerate the power

4. Which kind of turbines changes the pressure of the water entered through it?

a. Reaction turbines
b. Impulse turbines
c. Reactive turbines
d. Kinetic turbine

5. Which type of turbine is a Francis Turbine?

a. Impulse Turbine
b. crew Turbine
c. Reaction turbine
d. Turgo turbine

6. The overall efficiency of a reaction turbine is the ratio of

a. Actual work available at the turbine to the energy imparted to the wheel
b. Work done on the wheel to the energy (or head of water) actually supplied to the turbine
c. Power produced by the turbine to the energy actually supplied by the turbine
d. Actual work available at the turbine to energy imparted to the wheel

7. In a reaction turbine, the draft tube is used to _____

a. To increase the head of water by an amount that is equal to the height of the runner outlet above the tail race
b. To prevent air to enter the turbine
c. To increase pressure energy of water
d. To transport water to downstream

8. In reaction turbine hydraulic efficiency is_____

a. Ratio of actual work at the turbine to the energy imparted to the wheel.
b. Ratio of work done on the wheel to energy that is supplied to the turbine.
c. Ratio of power produced by the turbine to the energy actually supplied by the turbine.

d. Ratio of Work done on the wheel to the energy actually supplied to the turbine.

9. Which kind of turbine is a Pelton Wheel turbine?

a. **Tangential flow turbine**.
c. Outward flow turbine
b. Radial flow turbine
d. Inward flow turbine

10. Total head of turbines is_____

a. Pressure head + Static head
b. Kinetic head + Static head
c. Static head + Pressure head
d. **Pressure head + Kinetic head + Static head**

11. Head under which Kaplan turbine is operated_____

a. **a. 10-70 meters**
c. 100-200 meters
b. 70 -100 meters
d. Above 200 meters

12. Head under which Francis turbine is operated

a. 10-70 meters
c. 100-200 meters
b. 70-100 meters
d. **400 -600 meters**

13. The turbine is preferred for 0 to 25 m head of water?

a. Pelton wheel
c. Tube turbine
b. **Kaplan turbine**
d. Francis turbine

14._____ is defined as ratio between power delivered to runner and power supplied at inlet of turbine.

a. Mechanical efficiency
c. **Hydraulic efficiency**
b. Volumetric efficiency
d. Overall efficiency

15. Which among the following which is not an efficiency of turbine?

a. Mechanical efficiency
c. Hydraulic efficiency
b. Volumetric efficiency
d. **Electrical efficiency**

16. The ratio of power at the shaft of turbine and power delivered by water to runner is known as?

a. Mechanical efficiency
c. Hydraulic efficiency
b. Volumetric efficiency
d. Overall efficiency

17. The product of mechanical efficiency and hydraulic efficiency is known as?

a. Mechanical efficiency
c. Hydraulic efficiency
b. Volumetric efficiency
d. **Overall efficiency**

18. Among the following which turbine has highest efficiency?

a. **Kaplan turbine**
c. Pelton turbine
b. Francis turbine
d. Propeller turbine

19.……is ratio of volume of water actually striking the runner and volume of water supplied to turbine?

a. Mechanical efficiency
b. **Volumetric efficiency**
c. Hydraulic efficiency
d. Overall efficiency

20. To obtain maximum hydraulic efficiency of pelton turbine, blade velocity should be _____ Times the inlet velocity of jet.

a. **Half**
b. One quarter
c. Twice
d. Thrice

21. The ratio of volume available at shaft of turbine and power supplied at the inlet of the turbine

a. Mechanical efficiency
b. Volumetric efficiency
c. Hydraulic efficiency
d. Overall efficiency

22. Pipes of largest diameter which carry water from reservoir to the turbines is known as_____

a. Head stock
b. Tail race
c. Tail stock
d. Pen stock

23._____is an inward radial flow reaction turbine

a. Pelton turbine
b. Kaplan turbine
c. **Francis turbine**
d. Propeller turbine

24. Francis and Kaplan turbines are known as _____

a. Impulse turbine
b. **Reaction turbine**
c. Axial flow turbine
d. Mixed flow turbine

25. Specific speed of reaction turbine is between?

a. 5 and 50
b. **10 and 100**
c. 100 and 150
d. 150 and 300

26. Impulse turbine is generally fitted at _____

a. At the level of tail race
b. **Above the tail race**
c. Below the tail race
d. About 2.5mts above tail race to avoid cavitation's.

27. Hydraulic turbines are classified based on _____

a. Energy available at inlet of turbine
b. Direction of flow through vanes
c. Head at inlet of turbine
d. **Energy available, Direction of flow, Head at inlet.**

28. Impulse turbine and reaction turbine are classified based on ?

a. **Type of energy at inlet**
b. Direction of flow through runner
c. Head at inlet of turbine
d. Specific speed of turbine

29. Low specific speed, high specific speed and medium specific speed are classified based on

a. Type of energy at inlet
b. Direction of flow through runner
c. Head at inlet of turbine
d. **Specific speed of turbine**

30. Velocity triangles are used to analyze _____

a. Flow of water along blades of turbine
b. Measure discharge of flow
c. Angle of deflection of jet
d. **Flow of water, measure of discharge, angle of deflection.**

31. In which of following turbine inlet and outlet blade velocities of vanes are equal?

a. Francis turbine
b. Kaplan turbine
c. **Pelton turbine**
d. Propeller turbine

32. The work done per unit weight of water jet striking runner blades of Pelton turbine is given by expression _____

a. **[Vw1+Vw2] u/g**
b. Vw1*u/g
c. [Vw1+Vw2]/g
d. [Vw1+Vw2]u

33. In Pelton turbines the expression for power delivered at inlet to runner is given by _____

a. W*[Vw1+Vw2]u/g
b. W*[Vw1-Vw2]u/g
c. **W*[Vw1+Vw2]u/g, W*[Vw1-Vw2]u/g**
d. [Vw1+Vw2]u/g

34. Francis turbine is typically used for which of the following values of available heads?

a. 300 m
b. **100 m**
c. 30 m
d. 5 m

35. Draft tube is also called_____

a. **Straight divergent tube**
b. Simple elbow tube
c. Thermal tube
d. Elbow tube

36. A draft tube helps in converting kinetic energy into_____

a. Electrical work
b. **Mechanical work**
c. Chemical work
d. Thermal work

37. What is the purpose of a Draft tube?

a. **To prevent flow separation**
b. To avoid Pressure drag
c. To prevent rejection of heat
d. To increase efficiency

38. What is the maximum value of efficiency in a draft tube?

a. 100
c. 90
b. 50
d. 40

39. Turbine that consists of draft tubes is called as_____

a. Impulse turbine
c. Rateau turbine
b. Curtis turbine
d. **Reaction turbine**

40. In a Kaplan turbine, what is the direction of water flow?

a. **Axial and then axial**
c. Tangential and then axial
b. Radial and then axial
d. Tangential and then radial

41. For which of the following values of available heads may Kaplan turbine be used?

a. 250 m
c. 80 m
b. 100 m
d. **50 m**

42. Which of the following turbines will have the lowest number of blades in it?

a. Pelton turbine
c. Francis turbine
b. Steam turbine
d. **Kaplan turbine**

6. Pumps

Position in Question Paper **Total Marks-24**

Q.1.f) 2-Marks
g) 2-Marks
Q.4.d) 4-Marks
e) 4-Marks
Q.6.b) 6-Marks
c) 6-Marks

Descriptive Question

1. Define slip and negative slip of reciprocating pump. Explain the working of double acting reciprocating pump with neat sketch.
2. Sketch indicator diagram of single acting reciprocating pump with frictional head in suction and delivery pipe.
3. What is multistaging of centrifugal pumps? Explain pumps in parallel and pumps in series.
4. A centrifugal pump is to discharge 0.130 m3/s at a speed of 1200 rpm against a total head of 20 meter. The impeller diameter is 250 mm, its width at outlet is 40 mm and manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller
5. Explain working principle, construction and working of a double acting reciprocating pump with neat labeled diagram. Also write advantages of double acting reciprocating pump over single acting reciprocating pump.
6. What is cavitation in centrifugal pump? How it is prevented?
7. Draw performance and operating characteristic curves of a centrifugal pump.
8. Differentiate between centrifugal pump and reciprocating pump.
9. A centrifugal pump is to discharge 0.130 m3/s at a speed of 1200 rpm against a total head of 20 m. The impeller diameter is 250 mm, its width at outlet is 40 mm and monomeric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller.
10. Explain principle of working, construction and working of a centrifugal pump with neat labeled diagram.
11. Define slip, when negative slip occurs.

12. State the meaning of 'NPSH' with reference to centrifugal pump.

13. A centrifugal pump has the following characteristics: Outer diameter of impeller = 800 mm; width of impeller vanes at outlet = 100 mm; angle of impeller vanes at outlet = 40°. The impeller runs at 550 r.p.m and delivers 0.98 cubic metres of water per second under an effective head of 35 m. A 500 kW motor is used to derive the pump. Determine the manometric, mechanical and overall efficiencies of the pump. Assume water enters the impeller vanes radially at inlet.

14. Draw indicator diagrams of a reciprocating pump showing the effect of acceleration and friction head on suction and delivery pipes connected with air vessels and without air vessels.

15. State the remedial action done for each of the given below commonly experienced troubles during the operation of the centrifugal pumps:

(i) Pump fails to start pumping

(ii) Pump working, but not up to capacity and pressure.

(iii) Pump starts and then stops pumping.

(iv) Pump takes too much power.

16. Define submersible pump and jet pump with one application each.

17. State the methods of priming a centrifugal pump.

18. Draw inlet and outlet velocity triangles for bucket in Pelton wheel with the meaning of terms.

MCQ Question

(Total number of Question=Marks*3=16*3=48)

1. Centrifugal pump is a_____
- **a. Turbo machinery**
- c. Drafting device
- b. Flow regulating device
- d. Intercooling device

2. The main function of centrifugal pumps are to _____
- a. Transfer speed
- c. Transfer temperature
- b. Transfer pressure
- d. **Transfer energy**

3. Centrifugal pumps transfer energy from
- **a. Rotor to fluid**
- c. Draft to rotor
- b. Fluid to rotor
- d. Rotor to draft

4. Centrifugal pumps transport fluids by converting _____
- **a. Kinetic energy to hydrodynamic energy**
- b. Hydrodynamic energy to kinetic energy
- c. Mechanical energy to kinetic energy
- d. Mechanical energy to Hydrodynamic energy

5. The fluid coming into the centrifugal pump is accelerated by _____
- a. Throttle
- c. Nozzle
- **b. Impeller**
- d. Governor

6. The fluid gains _____ while passing through the impeller.
- a. Velocity
- c. Temperature
- b. Pressure
- **d. Velocity and pressure**

7. The velocity imparted by the impeller is converted into _____
- **a. Pressure energy**
- c. Momentum
- b. Kinetic energy
- d. Potential energy

8. What is a major advantage of centrifugal pump?
- a. Cost
- c. Efficiency
- **b. Simple in construction**
- d. Pump parameters

9. Pump efficiency is defined as the ratio of _____
- a. Pressure to temperature
- b. Temperature to pressure
- **c. Water horsepower to pump horsepower**
- d. Pump horse power to water horse power

10. The difference in the total head of the pump is called _____

a. Monomeric head c. Pressure head
b. Euler head d. Shaft head

11. What is the unit of energy head?
a. m c. m3/s
b. m/s d. /s

12. With the increase in energy head, efficiency _____
a. Decreases c. Remains same
b. Increases d. Independent

13. Power is most commonly expressed as _____
a. m c. m3/s
b. **KW** d. /s

14. The height of a column in a pump is called as _____
a. Vertical head c. **Static head**
b. Horizontal head d. Multi head

15. A multistage centrifugal pumps has more than two _____
a. Pumps c. Turbines
b. **Impellers** d. Magnetic pumps

16. The impeller is mounted on a _____
a. Draft tube c. Stuffing box
b. Throttle bush **d. Shaft**

17. At higher pressures, the impeller is connected in _____
a. Series c. Equilibrium
b. Parallel d. Series and parallel

18. When the flow output is higher, impellers are connected in_____
a. Series c. Equilibrium
b. Parallel d. Series and parallel

19. What is the common application of multistage centrifugal pump?
a. Mineral industries c. Removes ores
b. Boiler feed water pump d. Detects oil

20. When a pump casing is filled with liquid before it is started, it is called as _____
a. Adiabatic expansion c. Adiabatic compression
b. Priming d. Isentropic expansion

21. Priming is needed when impeller cannot impart enough _____
a. Draft speed c. Pressure
b. Energy d. Heat

22. In hydraulic head, NPSH is used for the analysis of _____

a. Adiabatic expansion
c. Wear
b. Priming
d. Cavitation

23. NPSH is the difference between _____
a. Suction pressure and vapour pressure
b. Vapour pressure and suction pressure
c. Suction pressure and heat
d. Shaft and head

24. What is the full form of NPSH in a pump?
a. Net pressure suction head
c. Non-pressure suction head
b. Net positive suction head
d. Net pressure super head

25. What is positive suction head?
a. Draft tube is above
c. Liquid level is above
b. Pump pressure is above
d. Turbine head is above

26. What is the shape of the diffuser in the centrifugal pump?
a. Round
c. Rectangle
b. Dough nut
d. Cylindrical

27. With the increase in the input power, efficiency _____
a. Increases
c. Same
b. Decreases
d. Independent

28. The formation of vapour cavities is called _____
a. Static pressure drop
c. Isentropic expansion
b. Cavitation
d. Emulsion

29. Cavitation usually occurs due to the changes in _____
a. Pressure
c. Volume
b. Temperature
d. Heat

30. The efficiency of the vane is given by _____
a. $1-V_2^2/ V_1^2$
c. V_2^2/ V_1^2
b. $1-(V_2^2/ V_1^2)$
d. $1- V_1^2$

31. The process of bubble generation leads to _____
a. High temperatures
c. High energy densities
b. High pressures
d. High volumetric ratio

32. Reciprocating pump is a _____
a. Negative displacement pump
c. Diaphragm pump
b. Positive displacement pump
d. Emulsion pump

33. Reciprocating pumps operate by drawing _____ into the chamber

a. Liquid
c. Heat
b. Pressure
d. Electricity

34. The cylinder of reciprocating cylinder is made up of _____
a. Cast iron
c. Aluminum
b. Wrought iron
d. Copper

35. Reciprocating pumps are classified according to _____
a. Drag force
c. Shock waves
b. Number of cylinders
d. Flow speed

36. Internal cavitation in reciprocating pumps occurs due to _____
a. Drag force
c. Shock wave
b. Cyclic stress
d. Flow speed

37. Power operated pump in which only one side engages the fluid displacement is called _____
a. Froth pump
c. Double acting
b. Single acting
d. Bicycle pump

38. Power operated pump in which only both sides engage the fluid displacement is called _____
a. Froth pump
c. **Double acting**
b. Single acting
d. Bicycle pump

39. The maximum efficiency of the reciprocating pump is _____
a. 20
c. 70
b. 50
d. **85**

40. Reciprocating pumps has ____ efficiency compared to centrifugal pumps
a. Higher
c. Equal
b. **Lower**
d. Exponential

41. During the suction stroke the _____ moves left thus creating vacuum in the Cylinder.
a. **Piston**
c. Valve
b. Cylinder
d. Pump

42. The speed of the reciprocating pump is generally measured in _____
a. Stokes.min
c. Rps
b. **Stokes/min**
d. rp/s

43. Reciprocating pumps give a _____ flow
a. Uniform
c. **Pulsating**
b. Non- uniform
d. Sinusoidal

44. Piston pumps are very _____

a. Expensive
c. Reasonable
b. Cheap
d. Intricate

45. Reciprocating pump is suitable for
a. **Low discharge flow**
c. High discharge flow
b. Medium discharge flow
d. None

46. Slip of reciprocating pump is defined as the....
a. Sum of actual discharge and theoretical discharge
b. Difference between actual discharge and theoretical discharge
c. Ratio of actual discharge to theoretical discharge
d. Product of actual discharge and theoretical discharge

47. In reciprocating pump air vessel is required for.
a. Smooth the flow
c. Reduce suction head
b. Increased delivery head
d. Reduce acceleration head

48. Which of following is an outlet pipe?
a. Suction pipe
c. Delivery pipe
b. Gateway pipe
d. Outlet pipe

49. Which of the following is an Advantages of Reciprocating Pumps?
a. High Pressure, Low Flow Applications
b. Proven, Common Technology
c. Durability
d. All of the above

50. Operation of reciprocating motion is done by a _____ source
a. Energy
c. Momentum
b. Power
d. Inertia