

Hydraulic Machines

1. Reciprocating pumps are no more to be seen in industrial applications (in comparison to centrifugal pumps) because of
- (a) high initial and maintenance cost
 - (b) lower discharge
 - (c) lower speed of operation
 - (d) necessity of air vessel
 - (e) all of the above.

Ans: a

2. In a centrifugal pump casing, the flow of water leaving the impeller, is
- (a) rectilinear flow
 - (b) radial flow
 - (c) free vortex motion
 - (d) forced vortex
 - (e) none of the above.

Ans: c

3. Head developed by a centrifugal pump depends on
- (a) impeller diameter
 - (b) speed
 - (c) fluid density
 - (d) type of casing
 - (e) (a) and (b) above.

Ans: e

4. For starting an axial flow pump, its delivery valve should be
- (a) closed
 - (b) open
 - (c) depends on starting condition and flow desired
 - (d) could be either open or closed
 - (e) partly open and partly closed.

Ans: b

5. The efficiency of a centrifugal pump is maximum when its blades are
- (a) straight
 - (b) bent forward
 - (c) bent backward
 - (d) bent forward first and then backward
 - (e) bent backward first and then forward.

Ans: c

6. In a centrifugal pump casing, the flow of water leaving the
- (a) radial
 - (b) radial
 - (c) centrifugal
 - (d) rectilinear
 - (e) vortex.

Ans: e

7. Centrifugal pump is started with its delivery valve
- (a) kept fully closed
 - (b) kept fully open
 - (c) irrespective of any position

- (d) kept 50% open
- (e) none of the above.

Ans: a

8. Axial flow pump is started with its delivery valve

- (a) kept fully closed
- (b) kept fully open
- (c) irrespective of any position
- (d) kept 50% open
- (e) none of the above.

Ans: b

9. When a piping system is made up primarily of vertical lift and very little pipe friction, the pump characteristics should be

- (a) horizontal
- (b) nearly horizontal
- (c) steep
- (d) first rise and then fall
- (e) none of the above.

Ans: c

10. One horsepower is equal to

- (a) 102 watts
- (b) 75 watts
- (c) 550 watts
- (d) 735 watts
- (e) 33000 watts.

Ans: d

11. Multistage centrifugal pumps are used to obtain

- (a) high discharge
- (b) high head
- (c) pumping of viscous fluids
- (d) high head and high discharge
- (e) high efficiency.

Ans: b

12. When a piping system is made up primarily of friction head and very little of vertical lift, then pump characteristics should be

- (a) horizontal
- (b) nearly horizontal
- (c) steep
- (d) first rise and then fall
- (e) none of the above.

Ans: b

13. In a single casing, multistage pump running at constant speed, the capacity rating is to be slightly lowered. It can be done by

- (a) designing new impeller
- (b) trimming the impeller size to the required size by machining
- (c) not possible
- (d) some other alterations in the impeller
- (e) none of the above.

Ans: b

14. If a pump is handling water and is discharging a certain flow Q at a constant total dynamic head requiring a definite B.H.P., the same pump when handling a liquid of

specific gravity 0.75 and viscosity nearly same as of water would discharge

- (a) same quantity of liquid
- (b) $0.75 Q$
- (c) $Q/0.75$
- (d) $1.5 Q$
- (e) none of the above.

Ans: a

15. The horse power required in above case will be

- (a) same
- (b) 0.75 B.H.P.
- (c) $\text{B.H.P.}/0.75$
- (d) 1.5 B.H.P.
- (e) none of the above.

Ans: b

16. Low specific speed of a pump implies it is

- (a) centrifugal pump
- (b) mixed flow pump
- (c) axial flow pump
- (d) any one of the above
- (e) none of the above.

Ans: a

17. The optimum value of vane exit angle for a centrifugal pump impeller is

- (a) $10-15^\circ$
- (b) $20-25^\circ$
- (c) $30-40^\circ$
- (d) $50-60^\circ$
- (e) $80-90^\circ$.

Ans: b

18. In a centrifugal pump, the liquid enters the pump

- (a) at the top
- (b) at the bottom
- (c) at the center
- (d) from sides
- (e) none of the above.

Ans: c

19. For small discharge at high pressure, following pump is preferred

- (a) centrifugal
- (b) axial flow
- (c) mixed flow
- (d) propeller
- (e) reciprocating.

Ans: e

20. In centrifugal pumps, maximum efficiency is obtained when the blades are

- (a) straight
- (b) bent forward
- (c) bent backward
- (d) radial
- (e) given aerofoil section.

Ans: c

21. Motion of a liquid in a volute casing of a centrifugal pump is an example of

- (a) rotational flow
- (b) radial
- (c) forced spiral vortex flow
- (d) forced cylindrical vortex flow
- (e) spiral vortex flow.

Ans: e

22. For very high discharge at low pressure such as for flood control and irrigation applications, following type of pump is preferred

- (a) centrifugal
- (b) axial flow
- (c) reciprocating
- (d) mixed flow
- (e) none of the above.

Ans: b

23. Medium specific speed of a pump implies it is

- (a) centrifugal pump
- (b) mixed flow pump
- (c) axial flow pump
- (d) any one of the above
- (e) none of the above.

Ans: b

24. High specific speed of a pump implies it is

- (a) centrifugal pump
- (b) mixed flow pump
- (c) axial flow pump
- (d) any one of the above
- (e) none of the above.

Ans: c

25. Indicator diagram of a reciprocating pump is a graph between

- (a) flow vs swept volume
- (b) pressure in cylinder vs swept volume
- (c) flow vs speed
- (d) pressure vs speed
- (e) swept volume vs speed.

Ans: b

26. Low specific speed of turbine implies it is

- (a) propeller turbine
- (b) Francis turbine
- (c) impulse turbine
- (d) any one of the above
- (e) none of the above.

Ans: c

27. Any change in load is adjusted by adjusting following parameter on turbine

- (a) net head
- (b) absolute velocity
- (c) blade velocity
- (d) flow
- (e) relative velocity of flow at inlet.

Ans: d

28. Runaway speed of a hydraulic turbine is

- (a) full load speed
- (b) the speed at which turbine runner will be damaged
- (c) the speed if the turbine runner is allowed to revolve freely without load and with the wicket gates wide open
- (d) the speed corresponding to maximum overload permissible
- (e) none of the above.

Ans: c

29. The maximum number of jets generally employed in impulse turbine without jet interference is

- (a) 4
- (b) 6
- (c) 8
- (d) 12
- (e) 16.

Ans: b

30. Medium specific speed of turbine implies it is

- (a) propeller turbine
- (b) Francis turbine
- (c) impulse turbine
- (d) any one of the above
- (e) none of the above.

Ans: b

31. High specific speed of turbine implies it is

- (a) propeller turbine
- (b) Francis turbine
- (c) impulse turbine
- (d) any one of the above
- (e) none of the above.

Ans: a

32. The specific speed of turbine is defined as the speed of a unit

- (a) of such a size that it delivers unit discharge at unit head
- (b) of such a size that it delivers unit discharge at unit power
- (c) of such a size that it requires unit power per unit head
- (d) of such a size that it produces unit horse power with unit head
- (e) none of the above.

Ans: d

33. Pick up the wrong statement about centrifugal pump

- (a) discharge \propto diameter
- (b) head \propto speed²
- (c) head \propto diameter
- (d) Power \propto speed³
- (e) none of the above is wrong.

Ans: a

34. A turbine pump is basically a centrifugal pump equipped additionally with

- (a) adjustable blades
- (b) backward curved blades
- (c) vaned diffusion casing
- (d) inlet guide blades
- (e) totally submerged operation facility.

Ans: c

35. Casting of a centrifugal pump is designed so as to minimize

- (a) friction loss
- (b) cavitation
- (c) static head
- (d) loss of kinetic energy
- (e) starting time.

Ans: d

36. In reaction turbine, draft tube is used

- (a) to transport water downstream without eddies
- (b) to convert the kinetic energy to flow energy by a gradual expansion of the flow cross-section
- (c) for safety of turbine
- (d) to increase flow rate
- (e) none of the above.

Ans: b

37. Guide angle as per the aerofoil theory of Kaplan turbine blade design is defined as the angle between

- (a) lift and resultant force
- (b) drag and resultant force
- (c) lift and tangential force
- (d) lift and drag
- (e) resultant force and tangential force.

Ans: a

38. Francis turbine is best suited for

- (a) medium head application from 24 to 180 m
- (b) low head installation up to 30 m
- (c) high head installation above 180 m
- (d) all types of heads
- (e) none of the above.

Ans: a

39. The flow rate in gear pump

- (a) increases with increase in pressure
- (b) decreases with increase in pressure
- (c) more or less remains constant with increase in pressure
- (d) unpredictable
- (e) none of the above.

Ans: c

40. Impulse turbine is generally fitted

- (a) at the level of tail race
- (b) little above the tail race
- (c) slightly below the tail race
- (d) about 2.5 m above the tail race to avoid cavitation
- (e) about 2.5 m below the tail race to avoid cavitation.

Ans: b

41. Francis, Kaplan and propeller turbines fall under the category of

- (a) Impulse turbines
- (b) Reaction turbines
- (c) Axial flow turbines
- (d) Mixed flow turbines
- (e) Reaction-cum-impulse turbines.

Ans: b

42. Reaction turbines are used for

- (a) low head
- (b) high head
- (c) high head and low discharge
- (d) high head and high discharge
- (e) low head and high discharge.

Ans: e

43. The discharge through a reaction turbine with increase in unit speed

- (a) increases
- (b) decreases
- (c) remains unaffected
- (d) first increases and then decreases
- (e) first decreases and then increases.

Ans: b

44. The angle of taper on draft tube is

- (a) greater than 15°
- (b) greater than 8°
- (c) greater than 5°
- (d) less than 8°
- (e) less than 3° .

Ans: d

45. Specific speed for reaction turbines ranges from

- (a) 0 to 4.5
- (b) 10 to 100
- (c) 80 to 200
- (d) 250 to 300
- (e) none of the above.

Ans: b

46. In axial flow fans and turbines, fluid enters and leaves as follows

- (a) radially, axially
- (b) axially, radially
- (c) axially, axially
- (d) radially, radially
- (e) combination of axial and radial.

Ans: c

47. Which place in hydraulic turbine is most susceptible for cavitation

- (a) inlet of draft tube
- (b) blade inlet
- (c) guide blade
- (d) penstock
- (e) draft tube exit.

Ans: a

48. Air vessels in reciprocating pump are used to

- (a) smoothen flow
- (b) reduce acceleration to minimum
- (c) increase pump efficiency
- (d) save pump from cavitation
- (e) increase pump head.

Ans: b

49. Saving of work done and power by fitting an air vessel to single acting reciprocating pump is of the order of

- (a) 39.2%
- (b) 49.2%
- (c) 68.8%
- (d) 84.8%
- (e) 91.6%.

Ans: d

50. Saving of work done and power by fitting an air vessel to double acting reciprocating pump is of the order of

- (a) 39.2%
- (b) 49.2%
- (c) 68.8%
- (d) 84.8%
- (e) 91.6%.

Ans: a

51. According to fan laws, for fans having constant wheel diameter, the air or gas capacity varies

- (a) directly as fan speed
- (b) square of fan speed
- (c) cube of fan speed
- (d) square root of fan speed
- (e) none of the above.

Ans: a

52. According to fan laws, for fans having constant wheel diameter, the pressure varies

- (a) directly as fan speed
- (b) square of fan speed
- (c) cube of fan speed
- (d) square root of fan speed
- (e) none of the above.

Ans: b

53. According to fan laws, for the fans having constant wheel diameters, the power demand varies

- (a) directly as fan speed
- (b) square of fan speed
- (c) cube of fan speed
- (d) square root of fan speed
- (e) none of the above.

Ans: c

54. According to fan laws, at constant speed and capacity, the pressure and power vary

- (a) directly as the air or gas density
- (b) inversely as square root of density
- (c) inversely as density
- (d) as square of density
- (e) as square root of density.

Ans: a

55. According to fan laws, at constant pressure, the speed capacity and power vary

- (a) directly as the air or gas density
- (b) inversely as square root of density
- (c) inversely as density
- (d) as square of density

(e) as square root of density.

Ans: b

56. According to fan laws, at constant weight of air or gas, the speed, capacity and pressure vary

- (a) directly as the air or gas density
- (b) inversely as square root of density
- (c) inversely as density
- (d) as square of density
- (e) as square root of density.

Ans: c

57. Pressure intensifier increases the pressure in proportion to

- (a) ratio of diameters
- (b) square of ratio of diameters
- (c) inverse ratio of diameters
- (d) square of inverse ratio of diameters
- (e) fourth power of ratio of diameters.

Ans: b

58. A hydraulic accumulator normally consists of

- (a) two cylinders, two rams and a storage device
- (b) a cylinder and a ram
- (c) two co-axial rams and two cylinders
- (d) a cylinder, a piston, storage tank and control valve
- (e) special type of pump with storage device and a pressure regulator.

Ans: b

59. A hydraulic intensifier normally consists of

- (a) two cylinders, two rams and a storage device
- (b) a cylinder and a ram
- (c) two co-axial rams and two cylinders
- (d) a cylinder, a piston, storage tank and control valve
- (e) special type of pump with storage device and a pressure regulator.

Ans: c

60. Hydraulic accumulator is used for

- (a) accumulating oil
- (b) supplying large quantities of oil for very short duration
- (c) generally high pressures to operate hydraulic machines
- (d) supplying energy when main supply fails
- (e) accumulating hydraulic energy.

Ans: d

61. Maximum impulse will be developed in hydraulic ram when

- (a) waste valve closes suddenly
- (b) supply pipe is long
- (c) supply pipe is short
- (d) ram chamber is large
- (e) supply pipe has critical diameter,

Ans: a