UNIT I OPEN CHENNEL FLOW

1. Define open channel flow with examples.

2. Explain laminar and turbulent flow.

3. What are the various types of flow in open channels?

4. Define the term uniform flow.

5. Define non uniform flow.

6. Distinguish between steady and unsteady flow.
7. Explain the terms:

   (i) Gradually varied flow and

   (ii) Rapidly varied flow.

   [Anna Univ.Nov'07&Nov'08]

8. Write down the formula for Froute number.

9. Define hydraulic mean depth.

10. Define specific energy. [Anna Univ.Nov'06&Nov'08]

11. Define critical flow.

12. Define critical velocity.

13. Distinguish between critical, sub critical and subcritical flows. Critical flow:

14. Differentiate prismatic and non-prismatic channels.

15. Explain specific force (F_c) [Anna Univ. Nov'08]

16. What is specific energy and what is condition for obtaining only one depth for a given specific energy? [Anna Univ. May'07]

17. Differentiate closed flow closed conduit flow and open channel flow. [Anna Univ. May'07]

18. Define uniform flow. Give examples.

19. What are the instruments used for measuring velocity in open channels? [May'06, May'07, May'08 & May'09]

20. What is cup type current meter?

21. Give some applications of laser Doppler Anemometer.

22. Write down the Manning's formula for determining velocity of flow in an open channel.

23. List the factors affecting Manning's roughness coefficient. [Nov'08] The following factors affecting Manning's roughness coefficient are:

   1.

24. What are the condition for obtaining most economical circular channel section for maximum velocity and discharge?

24. Show that maximization of discharge required minimization of the wetted perimeter of the channel for a given area of flow. [May'10]

25. Define non-erodible channels.

26. What are the factors considered while designing non-erodible channels?

27. How Stickler equation can be used to calculate roughness coefficient?

28. Define varied flow. Explain its classification.

29. Define gradually varied flow and rapidly varied flow in open channel. [Nov'07, May'08&Nov'08]

30. State the assumptions made in the derivation of dynamic equation for gradually varied flow. [Nov'08]

31. Distinguish between draw down and back water curves. [Nov'07, Nov'08 & May'10]

32. Write the expression to determine the length of the backwater curve. (Nov'09)

33. What is backwater curve in gradually varied flow profile and give practical example for getting this type of profile. (Nov'06)

34. What is normal slope of an open channel?

35. What are the flow profiles possible in mild sloped channels?

36. Classify surface profiles in a channel. [May'08 & Nov'06]

37. What are the methods used to determine the length of surface profile?

38. Define the Afflux. [Nov'08]

39. Write down the applications of transition.

40. What is hydraulic jump in horizontal bed channel? [Nov'06 & May'07]

15. Write the expression for hydraulic jump?

41. Define loss of energy due to hydraulic jump.

42. State the uses of hydraulic jump. [Nov'06, Nov'07 & May'10]

43. Explain the classification of hydraulic jumps. [May'10]

44. Define surges.

45. What are meant by positive and negative surges? [Nov'07]

46. Define the term backwater curve.

47. Write down the dynamic equation for gradually varied flow.

16 MARKS

1. Show that in rectangular channel maximum discharges occurs when the flow is critical for a given value of specific energy?
2. A trapezoidal channel has side slopes of 1 horizontal to 2 vertical and the slope of the bed is 1 in 2000. The area of the section is 42 m2. Find the dimensions of the section if it is to be most economical. Determine the discharge of the most economical section of C = 60.
3. Describe various types of flow in an open channel.
4. A rectangular channel with a base width of 0.60 m carries a discharge of 100 lps. The Chezy's C is 60. If the depth of flow is 0.25 m, determine the bed slope of the channel
5. In a flow through a rectangular channel for a certain discharge Froude number corresponding the two alternate depths are y1 and y2. Show that $(F_2/F_1)^{(3/2)} = (2+F_2^2)/(2+F_1^2)$
6. A rectangular channel 1.5m wide and depth 2.25m, discharge is 10m3/sec. calculate the specific energy and depth alternate to the given depth.
7. A trapezoidal channel has a bottom width 6m and side slope of 2h to 1v if a depth of flow is 1.2m at a discharge of 10m3/sec. compute the specific energy and critical depth.
8. Define wide open channel and also what are the important assumptions in hydraulic parameters?
9. The rectangular channel carries a discharge of 30m3/sec. The bottom width of the channel is 6.0m and flow velocity is 1.75m/sec. Determine two alternate depths possible in the channel.
10. If y_1 and y_2 are alternate depths in a rectangular channel show that $Y_C^3 = (2y_1^2 \, y_2^2) / (y_1 + y_2)$ And hence the specific energy $E = (y_1^2 + y_1 y_2 + y_2^2) / (y_1 + y_2)$
11. For a constant specific energy of 3.0m, what maximum flow may occur in a rectangular channel of 4.5m bed width?
12. The specific energy for a 3m wide channel is 8N.m/N. What is the maximum possible discharge in the channel?
13. Show that the minimum specific energy in a rectangular channel is 1.5 times the critical depth.
14. Show that the relation between alternate depths y_1 and y_2 in a rectangular channel can be expressed by $2y_1^2 \, y_2^2 / (y_1+y_2) = y_c$ where y_c is the critical depth of flow.
15. For a constant energy of 2.4N.m/N. Calculate the maximum discharge that may occur in a rectangular channel 4m wide.
16. For a purpose of discharge measurement the width of a rectangular channel is reduced gradually from 3m to2m and floor is raised by 0.3m at a given section when the approaching depth of flow is 2m, what rate flow will be indicated by a drop of 0.15m in the water surface elevation at the contracted section?
17. The specific energy for a 5m wide rectangular channel is 4m, the discharge of water through the channel is 19cumecs. Determine the alternate depths of flow?

UNIT –II UNIFORM FLOW

1. Define uniform flow. Give examples.

2. What are the instruments used for measuring velocity in open channels? [May'06, May'07, May'08 & May'09]

3. What is cup type current meter?

4. Give some applications of laser Doppler Anemometer.

5. Write down the Manning's formula for determining velocity of flow in an open channel.

6. List the factors affecting Manning's roughness coefficient. [Nov'08] The following factors affecting Manning's roughness coefficient are:

7. What are the condition for obtaining most economical circular channel section for maximum velocity and discharge?

8. Show that maximization of discharge required minimization of the wetted perimeter of the channel for a given area of flow. [May'10]

9. Define non-erodible channels.

10. What are the factors considered while designing non-erodible channels?

11. How Stickler equation can be used to calculate roughness coefficient?

12. Define varied flow. Explain its classification.

13. Define gradually varied flow and rapidly varied flow in open channel. [Nov'07, May'08&Nov'08]

14. State the assumptions made in the derivation of dynamic equation for gradually varied flow. [Nov'08]

15. Distinguish between draw down and back water curves. [Nov'07, Nov'08 & May'10]

16. Write the expression to determine the length of the backwater curve. (Nov'09)

17. What is backwater curve in gradually varied flow profile and give practical example for getting this type of profile. (Nov'06)

18. What is normal slope of an open channel?

19. What are the flow profiles possible in mild sloped channels?

20. Classify surface profiles in a channel. [May'08 & Nov'06]

21. What are the methods used to determine the length of surface profile?

22. Define the Afflux. [Nov'08]

23. What is transition in open channel?

24. Write down the applications of transition.

25. What is hydraulic jump in horizontal bed channel? [Nov'06 & May'07]

26. Write the expression for hydraulic jump?

27. Define loss of energy due to hydraulic jump.

28. State the uses of hydraulic jump. [Nov'06, Nov'07 & May'10]

29. Explain the classification of hydraulic jumps. [May'10]

30. Define surges.

31. What are meant by positive and negative surges? [Nov'07]

32. Define the term backwater curve.

33. Write down the dynamic equation for gradually varied flow.

34. Define varied flow. Explain its classification.

35. Define gradually varied flow and rapidly varied flow in open channel. [Nov'07, May'08&Nov'08]

36. State the assumptions made in the derivation of dynamic equation for gradually varied flow. [Nov'08]

37. Distinguish between draw down and back water curves. [Nov'07, Nov'08 & May'10]

38. Write the expression to determine the length of the backwater curve. (Nov'09)

39. What is backwater curve in gradually varied flow profile and give practical example for getting this type of profile. (Nov'06)

40. What is normal slope of an open channel?

41. What are the flow profiles possible in mild sloped channels?

42. Classify surface profiles in a channel. [May'08 & Nov'06]

43. What are the methods used to determine the length of surface profile?

16 MARKS

1. Determine the dimensions of the most economical trapezoidal channel with manning's n = 0.02, to carry a discharge of 14m3/sec at a slope of 4 in 10,000.

2. Determine the longitudinal slope of a triangular channel carrying 1.2m3/sec for a normal depth of flow 0.75m and a side slope 2 : 1. Take chezy's C = 45.

3. A trapezoidal channel with side slope 1 to 1 has to be designed to convey 10m3/sec at a velocity of a 2m/sec so that the amount of concrete lining for the bed and sides is the minimum. Calculate the area of lining required for one meter length of channel

4. What diameter of a semicircular channel will have the same discharge has a rectangular channel of width 2.5m and depth 1.25m?.Assume the bed slope and Manning's 'n' are the same for both the channels.

5. A canal is formed with side slopes 2:1 and a bottom width of 3.0m. The bed slope is 1 in 4500. Using manning's formula and assuming manning's 'n' as 0.025, calculate the depth of water for a discharge of 3.0m3/sec for a uniform flow.

6. For the purpose of discharge measurement width of a rectangular channel is reduced gradually from 4.0m to 2.0m and the flow is raised by 0.45m at a given section. When the approaching depth of flow is 2m, what rate of will be indicated by a drop of 0.3m in the water surface elevation at the contracted section?

7. Obtain an expression for the depth of flow in a circular channel which gives maximum velocity for a given longitudinal slope. The resistance to flow can be expressed by manning's equation.

8. In a rectangular channel 3.5m wide, flow depth of 2m, find how high can be raised without causing afflux. If the upstream depth of flow raised to 2.5m what should be the height of the hump? Flow in the channel is 26.67m3/sec.

9. Calculate the critical depth and corresponding specific energy for a discharge of 5.0m3/sec in the following channel.
i) Rectangular channel of bed width 2.0m
ii) Triangular channel of side slope 1h and .5v
iii) Circular channel of diameter 2.0m

10. Prove that for maximum discharge in circular channel the depth of flow is equal to 0.95 times diameter of the channel.

11. A trapezoidal channel having bottom width 6m and side slope 2h and 1v is laid in the bottom slope of 0.0016. If it carries a uniform flow of water at the rate of 10m3/sec, compute the normal depth and the mean velocity of flow. Take manning's as 0.025.

12. Define uniform flow in open channel and write chezy's equation.

13. The trapezoidal channel of bottom width of 3m side slope 1.5h and 1v carries discharge of 10m3/sec at a depth of 1.5m under uniform flow condition the longitudinal slope of channel is 0.001. compute manning's roughness coefficient of the channel

14. A circular pipe diameter 600mm carries discharge 0.2m3/sec will flow half full. Determine the slope of pipe to be laid in the ground. Assume manning's n=0.013 for concrete pipe. Also determine the depth of flow if the pipe is laid in a slope of 0.01.

15. Derive chezy's formulae to determine the velocity of flow in open channel
16. Determine the discharge through a rectangular channel of width 2m having a bed slope of 1 in 2000. The depth of flow is 1.5m and the value of manning constant n is 0.012.

17. Determine the dimensions of most economical trapezoidal channel section with 1.5 side slope to carry 10 cumecs of water on a bed slope of 1 in 1600.
18. The rate of flow of water through a circular channel of diameter 0.6m is 0.15 cumecs. Determine the slope of bed of the channel for maximum velocity. Assume c as 60.
19. Show that for a trapezoidal channel of a given area of flow, the condition of maximum flow requires that hydraulic mean depth is equal to one half of the depth of flow.
20. The circular sewer 0.6m inner diameter has a slope of 1 in 400. Find the depth when the discharge is 0.283m3/sec. take c=50.
21. List the various characteristics of critical state of flow through channels.
22. A trapezoidal channel having a bottom width of 5.0 m and side slope 2 : 1 is laid with a bottom slope of 1/750. If it carries a uniform flow of 8 m3/s compute the normal depth. Assume Manning's n = 0.025.
23. A canal is formed with side slopes 2: 1 and a bottom width of 3.0m. The bed slope is 1 in 4500. Using manning's formula and assuming manning's n as 0.025. Calculate the depth of water for a discharge of 3.0m3/sec for a uniform flow .
24. Define specific energy of flow at a channel section. Draw the specific energy curve and explain.

UNIT-III VARIED FLOW

1.Define varied flow. Explain its classification.

2.Define gradually varied flow and rapidly varied flow in open channel. [Nov'07, May'08&Nov'08]

3.State the assumptions made in the derivation of dynamic equation for gradually varied flow. [Nov'08]

4.Distinguish between draw down and back water curves. [Nov'07, Nov'08 & May'10]

5.Write the expression to determine the length of the backwater curve. (Nov'09)

6.What is backwater curve in gradually varied flow profile and give practical example for getting this type of profile. (Nov'06)

7.What is normal slope of an open channel?

8.What are the flow profiles possible in mild sloped channels?

9.Classify surface profiles in a channel. [May'08 & Nov'06]

10.What are the methods used to determine the length of surface profile?

11.Define the Afflux. [Nov'08]

12.What is transition in open channel?

13.Write down the applications of transition.

14.What is hydraulic jump in horizontal bed channel? [Nov'06 & May'07]

15.Write the expression for hydraulic jump?

16.Define loss of energy due to hydraulic jump.

17.State the uses of hydraulic jump. [Nov'06, Nov'07 & May'10]

18.Explain the classification of hydraulic jumps. [May'10]

19.Define surges.

20.What are meant by positive and negative surges? [Nov'07]

21.Define the term backwater curve.

22.Write down the dynamic equation for gradually varied flow.

23.Define uniform flow. Give examples.

24.What are the instruments used for measuring velocity in open channels? [May'06, May'07, May'08 & May'09]

25.What is cup type current meter?

26.Give some applications of laser Doppler Anemometer.

27.Write down the Manning's formula for determining velocity of flow in an open channel.

28.List the factors affecting Manning's roughness coefficient. [Nov'08] The following factors affecting Manning's roughness coefficient are:

29.What are the condition for obtaining most economical circular channel section for maximum velocity and discharge?

30.Show that maximization of discharge required minimization of the wetted perimeter of the channel for a given area of flow. [May'10]

31.Define non-erodible channels.

32.What are the factors considered while designing non-erodible channels?

33.How Stickler equation can be used to calculate roughness coefficient?

34.Define varied flow. Explain its classification.

35.Define gradually varied flow and rapidly varied flow in open channel. [Nov'07, May'08&Nov'08]

36.State the assumptions made in the derivation of dynamic equation for gradually varied flow. [Nov'08]

37. Distinguish between draw down and back water curves. [Nov'07, Nov'08 & May'10]

38. Write the expression to determine the length of the backwater curve. (Nov'09)

39. What is backwater curve in gradually varied flow profile and give practical example for getting this type of profile. (Nov'06)

40. What is normal slope of an open channel?

41. What are the flow profiles possible in mild sloped channels?

42. Classify surface profiles in a channel. [May'08 & Nov'06]

43. What are the methods used to determine the length of surface profile?

44. Define the Afflux. [Nov'08]

16 MARKS

1. Discuss briefly the types of hydraulic jump, its application
2. Explain the development of M, S and H profiles with neat sketches
3. Briefly explain the direct step method and standard step method to determine the gradually varied flow profiles.
4. Define gradually varied and rapidly varied flow in open channel?
5. Derive the relation between sequent depths in open channel?
6. Derive the dynamic equation of gradually varied flow.
7. Determine the slope of the free water surface in a rectangular channel of width 20m, having depth of flow 5m. the discharge through the channel is 52 cumecs. The bed slope of the channel is 1 in 4000. Assume chezy's constant c as 60.
8. During an experiment conducted on a hydraulic jump, in a rectangular open channel 0.5m wide, the depth of water changes from 0.2m to 0.5m. determine the discharge in the channel and the loss of head due to the formation of hydraulic jump.
9. Show that the loss of energy in a hydraulic jump $\wedge E = (y2-y1)3/ (4y1y2)$ where 'y1' and 'y2' are the conjugate depths.
10. Explain the direct step method for computing the length of the water surface profile.
11. State the application of hydraulic jump.
12. A partially open sluice gate discharges water at 10m/sec with 1m depth in a horizontal rectangular channel of width 5m. Can a hydraulic jump occur? If so find the sequent depth and energy loss.

13. Define uniform flow and draw the hydraulic gradient line, total energy lice and water surface for uniform flow.
14. A concrete lined trapezoidal channel (n=0.015) is to have a side slope of 1 horizontal to 1 vertical. The bottom slope is to be 0.004. Find the bottom width of the channel necessary to carry 100m3/sec of discharge at a normal depth of 2.5m.
15. Define most economical section in open channel and obtain the relation for a trapezoidal channel.
16. A rectangular channel 10m wide carries a discharge of 30m3/s. it is laid at a slope of 0.0001. if at a section in this channel, the depth is 1.6m, how far upstream or downstream from the section will the depth be 2.0. take manning's n as 0.015.
17. Show that the head loss in a hydraulic jump formed in a rectangular channel may be expressed as $\wedge E = (V1-V2)3/2g(V1+V2)$
18. A horizontal rectangular channel 4m wide carries a discharge of 16m3/sec. determine whether a jump may occur at an initial depth of 0.5m or not. If jump occurs determine the sequent depth to this initial depth.
19. A rectangular channel having bottom width 4.0m, manning's n=0.025, bottom slope 0.0005. The normal depth of flow in the channel is 2.0m. if the channel empties into a pool at the downstream and the pool elevation is 0.060m higher than the canal bed elevation at the downstream end, calculate the coordinates of the resulting gradually varied flow profile.
20. A sluice gate discharges 2.5m3/sec into a wide horizontal rectangular channel. The depth at the vena contracts is 0.2m. the tail water depth is 2.0m assuming the channel to have a manning's n=0.015, determine the location of the hydraulic jump.
21. What are the assumptions made to derive the gradually varied flow from the basic energy equation and derive an expression for water surface slope?
22. How dynamic equation of gradually varied flow is simplified in wide rectangular channel?
23. How surface profiles of Gradually Varied Flow are classified and explain them with sketches
24. Derive the dynamic equation of gradually varied flow in an open channel and also state the methods of estimating the flow profile.
25. A river 100m wide and 3m depth has an average bed slope of 0.0005. estimate the length of the gradually varied flow profile between 4.5m to 4m depth of flow. This back water profile produced by a low weir which raises the water surface just upstream of it by 1.5m from normal depth. Assume n=0.035
26. How to estimate the hydraulic jump and draw sketch of the jump
27. A rectangular channel of width 5m flows 1.5m in uniform flow bed slope of channel is 0.005. The uniform flow is blocked be a weir and flow depth

of 4m from bed of the channel. Determine the length of the back water profile between 4m to 2m. use direct step method and assume manning's n as 0.015

UNIT-IV TURBINES

1. What do you mean by turbine?

2. Define pump:

3. Explain net head

4. Define Hydraulic Efficiency:
5. Define mechanical efficiency

6. Define volumetric efficiency

7. Define over all efficiency

8. Explain impulse turbine

9. Explain Reaction turbine

10. Explain tangential flow turbine

11. Explain radial flow turbine

12. Explain inward flow radial turbine

13. Explain outward flow radial turbine

14. Define axial flow turbine

15. What is Pelton wheel:

16. What is breaking jet?

17. What is jet ratio?

18. What is Draft tube?

19. Define Degree of Reaction (R)

20. What is radial discharge?

21. Define Francis turbine:

22. Define propeller turbine:

23. Define Kaplan turbine:

24. What are the uses of draft tube?

25. What are types of draft tube?

26. What are the types of characteristic curves?

27. What is specific speed of the turbine?

28. Define unit quantities.

29. Explain about characteristic curves of a hydraulic turbine

30. What are the main parts of pelton wheel turbine?

31. What are the main mechanisms of Radial flow reaction turbine?

32. What are the classifications of hydraulic turbine according to the type of energy at inlet?

33. What are the types of turbine according to direction of flow through runner?

34. What are the types of turbine according to the head at the inlet of the turbine?

35. What do you know about Hub or Boss?

36. Under what head the propeller turbine take water?

37. What are the uses of Kaplan turbine?

16 MARKS

1. Explain the momentum principle with its application.
2. Explain the working of radial flow turbine with neat sketch.
3. Distinguish between impulse and reaction turbines.
4. Derive an expression for specific speed of a turbine.
5. Prove that the maximum efficiency is only 50%. When a liquid jet strikes a series a flat vanes mounted on the periphery of a wheel.
6. A reaction turbine works at 450 rpm under a head of 120m. The diameter at inlet is 120 cm and the flow area is 0.4m2. The angles made by absolute and relative velocities at inlet are 20 and 60 respectively with the tangential velocity. Find i) discharge ii) power developed and iii) hydraulic efficiency. Assume velocity of whirl at outlet is zero.
7. What is the main advantage of fitting draft tube in Francis turbine?
8. The velocity of whirl at inlet to the runner of an inward flow reaction turbine is 3.15VH m/sec and the velocity of flow at inlet is 1.05 Vh m/s. the velocity of whirl at exit is 0.22 Vh m/s in the same direction as at inlet and the velocity of flow at exit is 0.83 Vh m/s, where H is head of water 30m. the inner diameter of the runner is 0.6 times the outer diameter. Assuming hydraulic efficiency of 80%. Compute angle of the runner vanes at inlet and exit.
9. A impulse wheel has a mean bucket speed of 10 m/s with a jet of water flowing at the rate of 1.0m3/s under a head of 50m. The buckets deflects the jet through an angle of 165 degree. Calculate the power given by water to the runner and the hydraulic efficiency of the turbine. Assume coefficient of velocity as 0.99.
10. The external and internal diameters of an inward flow reaction turbine are 1.2m and 0.6 respectively. The head on the turbine is 22m and velocity of flow through the runner is constant and is equal to 2.5m/s. the guide blade angle is 10 degree and the runner vanes are radial at inlet. The discharge is radial at outlet. Determine i) the speed of the turbine ii) the vane angle at outlet iii) hydraulic efficiency
11. What are the main components of Kaplan turbine? Explain with a neat sketch.
12. A Kaplan turbine is to be designed to develop 9000 kW. The net available head is 5.6m. the speed ratio is 2.09 and the flow ratio is 0.68. the overall efficiency is 86% and the diameter of the boss is one third the diameter of the runner.

Determine the diameter of the runner, speed and specific speed of the turbine.
13. Classify hydraulic turbines.
14. A pelton wheel has to work under a head of 60m while running at 200 rpm. The turbine is to develop a power of 95.6475 kW. The velocity of buckets is 0.45 times of the velocity of jet. The overall efficiency is 0.80 and coefficient of velocity is 0.98. Design the pelton wheel.
15. A Kaplan turbine while working under a head of 35m develops power of 20,000kW. Assume flow ratio of 0.6, speed ratio of 2, the diameter of boss is 0.35times the diameter of the runner and overall efficiency is 85%. Find the diameter, speed and specific speed of the turbine
16. What are unit quantities? Define the unit quantities for a turbine. Why are they important?
17. Define the term ' 'governing of a turbine'. Describe with a neat sketch the working of an oil pressure governor.
18. What are the functions of draft tubes? Sketch the different types of draft tubes and explain the merits and demerits.
19. An inward flow reaction turbine works under a head of 22.5 m. The external and internal diameter of the runner is 1.35 m and 1.0 m respectively. The angle of guide vane is 15? And the moving vane is radial at inlet. Radial velocity of flow through runner is constant and equal to 0.2 there is no velocity of whirl at outlet. Determine the speed of the runner and the angle of vanes at outlet.
20. Determine the speed of a pelton wheel, its diameter, number of jet required and the size of each jet if it develops 13,800 MHP under a head 0f 430m. Its specific speed is 42. Assume necessary suitable values.

UNIT-V PUMPS

1. How are fluid machines classified?

2. What is centrifugal pump?

3. What are the main parts of centrifugal pump?

4. Write down the use of centrifugal pump?

5. Define multistage pump:

6. What is Net Positive Suction Head (NPSH)?

7. Define slip of a reciprocating pump and negative slip:

8. What do you know coefficient of discharge?

9. What do you know Drop down curve?

10. What is separation of reciprocating pump?

11. What is an indicator diagram?

12. What is Air vessel?

13. What is the purpose of an air vessel fitted in the pump?

14. What is the work saved by fitting a air vessel in a single acting, double acting pump?

15. What is Discharge through a Reciprocating Pump in per sec?

16. What is the relation between Work done of a Pump and Area of Indicator Diagram?

17. What is jet ratio?

18. What is Draft tube?

19. Define Degree of Reaction (R)

20. What is radial discharge?

21. Define Francis turbine:

22. Define propeller turbine:

23. Define Kaplan turbine:

24. What are the uses of draft tube?

25. What are types of draft tube?

26. What are the types of characteristic curves?

27. What is specific speed of the turbine?

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33. What are the types of turbine according to direction of flow through runner?

34. What are the types of turbine according to the head at the inlet of the turbine?

35. What do you know about Hub or Boss?

36. Under what head the propeller turbine take water?

37. Define surges.

38. What are meant by positive and negative surges? [Nov'07]

39. Define the term backwater curve.

16 MARKS

1. The centrifugal pump has the following characteristics. Outer diameter of impeller is 800mm: width of the impeller vane at outlet = 100mm: angle of the impeller vanes at outlet is 40 degree. The impeller runs at 550 rpm and delivers 0.98m3/sec under an effective head of 35m. A 500kW motor is used to drive the pump. Determine the manometric, mechanical and overall efficiencies of the pump. Assume water enters the impeller vanes radially at inlet.

2. Distinguish between single stage pump and multistage pump.
3. The diameters of an impeller of a centrifugal pump at inlet and outlet are 300mm and 600mm respectively. Determine the minimum starting speed of the pump of it work against head of 28m.
4. Explain the working principle of single acting reciprocating pump with neat sketch.
5. A single acting reciprocating pump running at 50rpm delivers 0.01m3/sec of water. The diameter of the plunger is 200 mm and the stroke length is 400mm. the delivery and suction head are 10m and 5m respectively. Determine the theoretical discharge, slip, percentage slip, coefficient of discharge and the power required to derive the pump.
6. Define manometric efficiency and net positive suction head (NPSH).
7. A centrifugal pump works against a net head of 20m at a speed of 1200rpm. The vane angle at outlet is 30deg the empeller diameter and with at outlet are 40cm and 6cm respectively. Find the discharge. Take manometric efficiency as 95%.
8. The inlet and outlet diameter s of the impeller of a centrifugal pump are 25cm and 50 cm respectively. The velocity of flow at outlet of flow is 2.5m/s and the vanes are set back at an angle of 45deg at the outlet. Find the minimum starting speed if the manometric efficiency is 0.8.
9. Explain the working of single acting reciprocating pump with air vessel.
10. A single acting reciprocating pump running at 30rpm has a stroke length of 40cm and piston diameter of 20cm. the suction head is 3.0m and length and diameter of suction pipe are 6m and 10cm respectively. Take f=0.02 and Hatm=10.3m of water. Find the absolute pressure head inside the cylinder at the beginning middle and end of suction stroke.
11. What is specific speed of a pump and what is its importance?
12. The cylinder bore diameter of a single acting reciprocating pump is 150mm. and its stroke length is 300 mm. the pump runs at 50 rpm and lifts water through a height of 25m. The delivery pipe is 22m long and 100mm in diameter. Find the theoretical discharge and the theoretical power required to run the pump. If the actual discharge is 4.2 litres/s, find the percentage slip.
13. A single acting reciprocating pump is installed 3.5 m above the water level in the pump. The suction pipe is 20cm in diameter and 10m in length. The piston is of 30cm diameter and has 50cm stroke. Determine the speed at which separation may take place. Take Hatm=10.3m of water and Hsep=2.5m of water absolute.
14. A single acting reciprocating pump having a plunger of 12cm diameter and a stoke of 25 cm draws a water from a sump 2m below its center and delivers to a tank 10m above its centre. The diameter of the pipe is 8cm and the suction pipe is 3m long and the delivery pipe is 12m long. An air vessel is fitted to the delivery pipe alone very near to the pump axis. The separation pressure is 8kN/m2 below atmospheric pressure. The density of the liquid pumped is 1200 kg/m3 and the friction factor for the pipes is 0.01. Find the maximum speed of the pump to run without separation to occur. Also determine the power required to run the pump at this speed.
15. What is an air vessel? Describe the function of the air vessel for reciprocating pumps.
16. Describe the principle and working of a reciprocating pump with a neat sketch.
17. Explain the occurrence of negative slip.
18. Explain: Priming, specific speed of a centrifugal pump. (6)
19. What is the difference between single-stage and multistage centrifugal pumps?
20. Describe multistage pump with (1) impellers in parallel and (2) impellers in series
21. Explain various losses occurring in a centrifugal pump.
22. A centrifugal pump has an impeller of 0.50 m outer diameter. It runs at 750 rpm and discharges 140 lps against a head of 10 m. The water enters the impeller without whirl and shock. The inner diameter is 0.25 m. The vanes are set an angle of 45? at the outlet. The area of flow is constant from inlet to outlet of the impeller and equals to 0.06 m2.
23. Determine (1) Manometric efficiency of the pump (2) Vane angles at inlet.
24. Explain with sketch how multi cylinder pump supplies more uniform flow as compared to single cylinder pump without any air vessel.
25. Explain the principle of gear pump and rotating cylinder pump.
26. A single acting reciprocating pump discharges 51/ sec with cylinder bore diameter 200mm and its stroke length 300mm. The pump runs at 350rpm and lifts water through a height of 25m. The delivery pipe is 30m long and 100 mm in diameter. Find the theoretical discharge and theoretical power required to run the pipe and determine the percentage slip and also determine the delivery head due to acceleration at beginning, middle and end.