HYDRAULIC STRUCTURES
Multiple choice Questions
(M.C.Q.)

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CULVERT

1- the internal roughness of a culvert is a function of
   a- the culvert material and the roughness of the channel itself.
   b- Culvert dimensions
   c- Culvert length
   d- Wetted perimeter
2- . A structure that allows water to flow under a road, railroad, trail, or similar obstruction from one side to the other side is called as _____
   a- Drainage
   b- Bridges
   c- Tunnel
   d- culverts
3- The side drains and partially filled culverts are designed on the basis of _____
   a- Open channel flow
   b- Hydrological analysis
   c- Pavement geometry
   d- Run off
4- An _____ culvert is normally a low profile culvert. It allows them to be installed without disturbing the causeway as it will span over the entire drainage width.
   a- Box
   b- Rectangle
   c- Arch
   d- Circular
5- An _____ culvert is normally a low profile culvert. It allows them to be installed without disturbing the causeway as it will span over the entire drainage width.
   a- Box
   b- Rectangle
   c- Arch
   d- circular
6- **Which of the following statements is not correct**
   a- In slab culvert, a R.C.C slab is simply supported over abutments.
   b- A box culvert is constructed of R.C.C with one or more box casted monolithically.
   c- In a box culvert, a pipe is fitted to drain off water.
   d- Arch culverts are culverts having its superstructure consisting of one or two arches.
7- Which one of the followings at the entrance of a culverts controls the flow capacity of the culvert?
   a- Depth of headwater
   b- Cross-sectional area
   c- Inlet edge configuration
   d- Barrel shape
8- Following factors affect the flow through culvert
   a- Geometry
   b- Bottom slope
   c- Tail water conditions
   d- All of the above
9- Flow through culvert is
   a- Upstream controlled
   b- Downstream controlled
   c- Both
   d- None of the above
10- When the culvert is partially full, the flow will be
   a- Subcritical
   b- Supercritical

c- Critical
d- Uniform

11- What is the function of waterstops in joints of box culverts and drainage channels?
a- to avoid water contacting joints' dowel bars and causing corrosion
b- to avoid water seeping in from the underside of drainage channels or box culverts
c- Both of a & b
d- None of the above

12- Culverts are all those road bridges, .whose spans are up to :
a- 6 m
b- 8 m
c- 10 m
d- 12 m

13- What is the minimum diameter used in pipe culverts
a- 25 cm
b- 35 cm
c- 45 cm
d- 75 cm

14- Culverts come in many sizes and shapes including round, elliptical, box , and
a- flat-bottomed
b- open-bottomed
c- pear-shaped
d- All the above

15- The culvert type and shape selection is based on a number of factors including
a- requirements for hydraulic performance
b- limitations on upstream water surface elevation
c- roadway embankment height
d- All of the above

16- The process of removing culverts to restore an open-air watercourse is known as deculverting. the practice is also known as
a- Daylighting
b- Out lighting
c- Inlighting
d- None of the above

17- Culverts can be constructed from variety of materials , one of these materials is plastic , specifically from
a- Polypropylene
b- High density polyethylene HDPE
c- Low density polyethylene LDPE
d- Polyurethane

18- Undersized and poorly placed culverts can cause environmental impact such as
a- Degrade water quality via scour and erosion
b- Restrict the movement of aquatic organisms between upstream and downstream habitat
c- Both a & b
d- None of the above

19- When energy loss in culvert or waterway need to be minimized , then
a- Only the inlet must be streamlined to avoid losses at inlet
b- Both the inlet and outlet must be streamlined to avoid significant form losses
c- Using steep slope
d- None of the above

20- For applications of very large flow, cast in situ culverts is the most adequate solution as the large sizes of precast culverts are difficult to be transported and installed, in this situation it is not preferred to design a circular cross section culvert (in spite of circular shape is the most hydraulic efficient structure) because

a- fabrication of formwork for circular shape is difficult when compared with normal box culvert structures
b- Box culvert have minimum head losses
c- Both a & b
d- None of the above

21- In culvert design , when the headroom is limited , it is preferred to use box culvert because
a- Box culvert is more economical
b- Box culvert is more hydraulic efficient
c- the height of box culverts can be reduced to fit with available headroom and increase the width of the culvert while the size of pipe culverts is fixed
d- None of the above

22- for some difficult site conditions, e.g. excavation of structure in rock sometimes it is preferred to use box culvert instead of circular culvert because
a- for the same equivalent cross-sectional area, the width of box culverts can be designed to be smaller than that of pipe culverts and this enhances smaller amount of excavation and backfilling.
b- Ease of installation
c- Both a & b
d- Box culvert is more hydraulic efficient

23- If a choice has to be made between a single-cell box culvert and smaller multiple pipes, it is better to select single-cell box culvert because
a- lower risk of blockage
b- Ease of installation
c- Lower cost
d- None of the above

24- The use of double-cell box culverts is preferred to single-cell box culverts for cross-sectional area larger than about $5m^2$ because
a- Lower cost
b- Ease of installation
c- The double-cell box is more hydraulic efficient than single-cell box culvert
d- the use of double-cell box culvert can shorten the height of culverts by having a wider base if we have limited headroom

25- For small flow , it is better to use precast pipe culvert than using box culvert because
a- Pipe culvert is the most hydraulic efficient
b- Precast pipe culvert have lower cost
c- Precast pipe culvert easier in installation
d- All of the above

ANSWERS

Q	The correct choice	
1	A	the culvert material and the roughness of the channel itself.
2	D	Culverts
3	A	Open channel flow
4	C	Arch
5	A	Box
6	C	In a box culvert, a pipe is fitted to drain off water.
7	B	Cross sectional area
8	D	All of the above
9	C	Both
10	A	Subcritical
11	C	Both of a & b

12	B	8 m
13	D	75 cm
14	D	All of the above
15	D	All of the above
16	A	Daylighting
17	B	High density polyethylene HDPE
18	C	Both a & b
19	B	Both the inlet and outlet must be streamlined to avoid significant form losses
20	A	fabrication of formwork for circular shape is difficult when compared with
21	C	the height of box culverts can be reduced to fit with available headroom and
22	A	for the same equivalent cross-sectional area, the width of box culverts can be designed to be smaller than that of pipe culverts and this enhances smaller amount of excavation and backfilling.
23	A	lower risk of blockage
24	D	the use of double-cell box culvert can shorten the height of culverts by having a wider base if we have limited headroom
25	D	All of the above

LOCAL SCOUR

1- To avoid local scour damage you can use
   a- Apron
   b- Steel blades obstruction
   c- Geotextile carpet with a toe or rocks on the seaward side
   d- None of the above
2- The vertical reduction in the riverbed measured from bed level prior to the commencement of the scour action is called
   a- Scour depth
   b- Scour damage
   c- Scour effect
   d- None of the above
3- The total scour at the bridges site components are , Local scour and
   a- Contraction scour
   b- The aggradation and degradation
   c- Both a and b
   d- Expansion scour
4- The local scour is caused by
   a- Changing in flow direction of the water way
   b- The acceleration of the flow and resulting vortices induced by the flow obstruction
   c- Sudden changing in flow depth
   d- All of the above
5- Local scour can occur as
   a- Clear – water scour
   b- Live – bed scour
   c- Both a & b
   d- Turbulent scour
6- The difference between clear-water and live-bed scour is that in live-bed scour the scour hole is
   a- Continuously supplied with sediment by the approach flow
   b- Continuously creeping to downstream side

c- Continuously increases in its depth
d- None of the above

7- Degradation scour involves
a- Formation of an elliptical hole
b- Lowering of the bed of the stream consistently
c- None of the above

8- Scour occurs at coastal regions as a result of
a- Passage of waves
b- Tides
c- None of the above

9- Contraction scour results from a
a- Reduction of the flow area
b- Reduction of the flow depth
c- Increasing of water viscosity
d- All of the above

10- To prevent scour damage , bed armoring techniques are used such as
a- Riprap
b- ACB (articulating concrete blocks)
c- Gabions
d- All of the above

11- Concrete armor units is one of the bed armoring techniques to prevent scour effect and also called
a- Articulating concrete blocks
b- Concrete stone
c- Artificial riprap
d- none of the above

12- the advantage of concrete armor units as compared to riprap is that they greater stability due to
a- heavier weight
b- steel reinforcement
c- interlocking of their complex shape
d- higher width

13- Scour is a natural phenomenon caused by ---------- of the flowing water on the bed and banks of alluvial channels
a- Erosive action
b- Tide currents
c- Wind storms
d- None of the above

14- The degradation scour component is natural and has _____ effect on streambed elevation changes
a- Short-term
b- Instant
c- No effect
d- Long-term

15- Local scour occurred at bridge piers are caused by the interference of the piers with flowing water. This interference will result in a considerable _____ in the mean velocity of the flowing water in the channel section
a- Decrease
b- Oscillating
c- Increase
d- None of the above

16- In live-bed scour the scour hole is continually supplied with _____by the approach flow and an equilibrium is attained
a- Sediment

b- Currents
c- Air bubbles
d- None of the above

17- The scour depth is related to the Pier Reynolds number which is defined as the flow velocity multiplied by pier width divided by _____ of the flowing water
a- Water depth
b- Difference in elevation
c- Kinetic viscosity
d- None of the above

18- Shen suggested that the clear water scour is being equal to
a- $0.0022\ R^{0.619}$
b- $0.0022\ V^{0.619}$
c- $0.0022\ R^{2\backslash 3}$
d- None of the above where R= Pier Reynold number and v= mean velocity

19- The following linear equation was given by Shen to estimate the scour depth
a- ds=1.4b
b- ds=2.4b
c- ds=0.4b
d- none of the above

20- Piers which induce a pressure field strong enough to cause the formulation of the horseshoe vortex system are termed
a- Sharp-nosed
b- Blunt-nosed
c- Fair-nosed
d- None of the above

21- Total scour at the bridge site is comprised of three components, namely the aggradation and degradation, _____, and the local scour.
a- Expansion scour
b- Contraction scour
c- Rising scour
d- None of the above

22- The basic mechanism causing local scour at piers is the _____ at the upstream face of the pier and formation of vortices at the base.
a- Laminar flow
b- Down-flow
c- Turbulent flow
d- Waves

23- Scour induced by currents is one of the main causes of the bridge _____in rivers
a- Failure
b- Design
c- High span length
d- None of the above

24- The instantaneous bed shear stress was found to be directly associated with the dynamics of the turbulence _____
a- horseshoe vortex
b- flow
c- flowrate
d- none of the above

25- Sediments transport rate based on the mean shear stress could be underestimated as much as _____ compared to the instantaneous shear stress in clear-water scour conditions
a- 25 %

b- 60 %
c- 90 %
d- 70 %

ANSWERS

Q	The correct choice	
1	c	Geotextile carpet with a toe or rocks on the seaward side
2	A	Scour depth
3	C	Both a & c
4	B	The acceleration of the flow and resulting vortices induced by the flow
5	C	Both a & b
6	A	Continuously supplied with sediment by the approach flow
7	B	Lowering of the bed of the stream consistently
8	A	Passage of waves
9	A	Reduction of the flow area
10	D	All of the above
11	C	Artificial riprap
12	C	interlocking of their complex shape
13	A	Erosive action
14	D	Long term
15	C	Increase
16	A	Sediment
17	C	Kinetic viscosity
18	A	$0.0022\ R^{0.619}$
19	A	ds=1.4b
20	B	Blunt-nosed
21	B	Contraction scour
22	B	Down-flow
23	A	Failure
24	A	Horseshoe vortex
25	D	70 %

SPILLWAY

SPILLWAY

1- The safety valve of a dam is its _____.
   a- drainage gallery
   b- inspection gallery
   c- Spillway
   d- outlet sluices

1- An ungated spillway starts functioning as soon as the water level in the reservoir crosses the _____
   a- maximum reservoir level
   b- minimum reservoir level
   c- maximum conservation level

d- full Supply level

2- Which of the following spillway is least suitable to earthen dams?
   a- Ogee spillway
   b- Chute spillway
   c- Side-channel spillways
   d- Shaft spillway

3- If the operating head on an ogee spillway is more than the design head then _____
   a- the pressure on the crest will be zero
   b- the pressure on the crest will be negative causing cavitation
   c- the pressure on the crest will be positive
   d- the discharge coefficient of the spillway will be reduced

4- In the functioning of an ogee spillway, the operating head _____
   a- frequently exceeds the design head
   b- rarely exceeds the design head
   c- never exceeds the design head
   d- has no connection with the design head

5- Which of the following spillway is an improvement over free overflow spillway?
   a- Straight drop spillway
   b- Open channel spillway
   c- Overflow spillway
   d- Siphon spillway

6- The spillway which can be called as an overflow spillway is essentially _____.
   a- an ogee spillway
   b- a shaft spillway
   c- a chute spillway
   d- a syphon spillway

7- According to US Army Corps, the u/s profile of ogee spillway extends up to _____
   a- x = 1.27 Hd
   b- x = -1.27 Hd
   c- x = 0.431 Hd
   d- x = -0.431 Hd

8- Which of the following plot is useful in determining the clearance for the spillway deck bridge and the top levels of walls on the side of the spillway?
   a- The coordinates of the lower nappe
   b- The coordinates of the upper nappe
   c- Both the coordinates of upper and lower nappe
   d- The origin or apex of crest

9- What is the satisfactory radius for the reverse bottom curve which is provided at the downstream end of the spillway?
   a- One-fourth of the spillway height
   b- Equal to the spillway height
   c- Half the value of the spillway height
   d- One-third of the spillway height

10- If the upstream face of the spillway is kept vertical, the crest shape should also confirm to the lower nappe of an inclined sharp-crested weir.
   a- True
   b- False

12- Which of the following is the simplest type of spillway and may be constructed on small bunds or thin arch dams?
   a- Straight drop spillway
   b- Ogee spillway

c- Shaft spillway
d- Siphon spillway

13- The spillway can be best built independently of the dam when there is _____.
a- deep narrow gorge with steep slopes
b- deep narrow gorge with gradual slopes
c- wide gorge with a gradual slope
d- wide valley with moderate slope

14- Which of the following is asecondary safety arrangement?
a- Safety valves
b- Spillway gates
c- Subsidiary spillway
d- Energy dissipaters

15- Which of the following is the simplest type of spillway which can be provided independently and at low costs?
a- Ogee spillway
b- Trough spillway
c- Siphon spillway
d- Saddle spillway

16-If the spillway is constructed in continuation to the dam at one end, it may be called as _____
a- saddle weir
b- flank weir
c- waste weir
d- temporary weir

17- The spillway which can be adopted with ease on gravity as well as earthen dams is _____
a- ogee spillway
b- chute spillway
c- both ogee and chute spillway
d- straight drop spillway

18- The surplus reservoir waterafter spilling over the crest of the spillway flow on the chute is
a- parallel to the crest in a trough spillway
b- parallel to the crest in a side-channel spillway
c- perpendicular to the crest in a side-channel spillway
d- obliquely to the crest in a chute spillway

19- Whenever the slope of chute changes from steeper to milder _____ curve shall be provided.
a- a concave vertical curve
b- a convex vertical curve
c- a hyperbolic curve
d- a parabolic curve

20. The side slope of approach channel of chute spillway is _____
a- 1:1
b- 1:1 12
c- 1:3
d- 1:2.5

21. The spillway which may sometimes be called as a waste weir is _____
a- an ogee spillway
b- a trough spillway
c- a shaft spillway
d- a siphon spillway

22. The effective length of an ogee spillway will be different from it" actual length, in case of_____
a- gated spillway

b- ungated spillway
c- both gated as well as ungated spillway
d- none of these.

23- Hydraulic jump is widley used for dissipation of energy in _____
a- ogee spillways
b- trough spillways
c- side channel spillways
d- all of these

24. In computing the spilling capacity of high ogee spillways, the velocity head is usually _____
a- very small, and hence neglected
b- very large, and hence cannot be neglected
c- neither a) nor b)

25. The spillway, which can be called as an 'overflow spillway', is essentially _____
a- an ogee spillway
b- shaft spillway
c- chute spillway
d- syphon spillway
e-

ANSWERS

1.C.

2.C.

3.A.

4.B.

5.B.

6.C.

7.A.

8.B.

9.B.

10.A.

11.B.

12.A.

13.A.

14.C.

15.B.

16.B.

17.B.

18.B.

19.A.

20.A.

21.B.

22.A.

23.D.

24.A.

25.A.

HYDRAULIC MODEL

1- Which of the following are advantages of simulation?
   a) Simulation allows "what-if?" type of questions.
   b) Simulation can usually be performed by hand or using a small calculator.
   c) Simulation does not interfere with the real-world system.
   d) all of the above

2. The first step in simulation is to ;
   a) set up possible courses of action for testing.
   b) construct a numerical model.
   c) validate the model.
   d) define the problem.
   e) none of the above

3. Which of the following are disadvantages of simulation?
   a) inability to analyze large and complex real-world situations
   b) "time compression" capability
   c) could be disruptive by interfering with the real-world system
   d) is not usually easily transferable to other problems
   e) all of the above

4. Cumulative probabilities are found by;
   a) summing all the probabilities associated with a variable.
   b) simulating the initial probability distribution.
   c) summing all the previous probabilities up to the current value of the variable.
   d) any method one chooses.
   e) none of the above

5. If we are going to simulate an inventory problem, we must;
   a) run the simulation for many days.
   b) run the simulation for many days many times, i.e., using multiple sets of random numbers.
   c) run the simulation many times, i.e., using multiple sets of random numbers.
   d) run the simulation once, for a relative short period of time.
   e) none of the above

6. From a practical perspective, if we have a waiting line problem for which the Poisson and negative exponential distributions do not apply, and we desire a reasonably accurate solution, we should;
   a) modify the queuing equations to make them appropriate for our problem.
   b) use simulation.
   c) use the simple queuing equations even though we realize they are inappropriate.
   d) build a physical model and use that to study the problem.
   e) none of the above

7. The three types of mathematical simulation models are;
   a) operational gaming, systems simulation.
   b) queuing, maintenance policy.
   c) systems simulation, computer gaming.
   d) system simulation, operational gaming, weather forecasting.
   e) none of the above

8. Simulation should be thought of as a technique for;

a) increasing one's understanding of a problem.
b) obtaining a relatively inexpensive solution to a problem.
c) obtaining an optimal solution to a problem.
d) providing quick and dirty answers to complex problems.
e) none of the above

9. All simulations involve:
a) The passage of time
b) A model on a computer
c) An imitation of a system
d) A visual display

10. The simulations described in the book are used for:
a) Understanding a system
b) Understanding and improving a system
c) Improving a system
d) None of the above

11. Which of the following is not a simulation method?
a) Monaco simulation
b) System dynamics
c) Agent-based
d) Discrete-event

12. The key reasons for using simulation are that systems are subject to:
a) Variability, interconnectedness and complexity
b) Variability, interconnectedness and simplicity
c) Variability, information and complexity
d) External shocks, interconnectedness and complexity

13. Which of the following is not a reason to use simulation?
a) It requires a lot of data
b) It is cheaper and quicker than experimenting with the real system
c) It enables the conditions of an experiment to be controlled
d) It fosters a creative approach to improving a system

14. Which of the following systems can be simulated?
a) Transportation systems
b) Manufacturing systems
c) Health systems
d) All of the above

15. When developing a conceptual model, it is important to:
a) Abstract to develop a simple model of the real system
b) Model everything that is known about the real system
c) Remove any elements from the model about which there is limited knowledge
d) None of the above

16. When is a conceptual model developed?
a) Before the computer model is developed
b) During development of the computer model
c) After an initial computer model has been developed
d) All of the above

17. Which of the following is not a reason for preferring a simple model?
a) They can be developed faster
b) They require less data
c) They run faster
d) They are always more accurate

18. A conceptual model should be:

a) Valid, incredible, feasible and have utility
b) Verified, credible, feasible and have utility
c) Valid, credible, feasible and have utility
d) Valid, credible, feasible and believable

19. Which of the following is not a means for representing a conceptual model?
a) Component list
b) Activity cycle diagram
c) Pie chart
d) Process flow diagram

20. The modelling objectives should describe:
a) What needs to be achieved
b) The level of performance that is required
c) Any constraints that need to be worked within
d) If possible, all of the above

21. Which of the following is not a general project objective?
a) Flexibility
b) Model scope
c) Time-scale
d) Ease-of-use

22. Model outputs should:
a) Only report on variables that are relevant to the modelling objectives
b) Report on variables relevant to the modelling objectives and why the objectives are not being
a) achieved
b) Only report on variables that explain why the modelling objectives are not being achieved
c) Report on every aspect of the model

23. The scope of a model can be described in terms of:
a) Entities, activities, queues and resources
b) Entities, activities, queues and processes
c) Entities, services, queues and processes
d) Items, activities, failures and resources

24. In determining the level of detail in a model, which of the following should be done?
a) Choose to exclude key components
b) Fit distributions to data about components of the system
c) Identify any simplifications that are being made
d) All of the above

25. For a simulation study to be successful which of the following must be achieved?
a) The study achieves its objectives
b) The findings are implemented
c) Money is saved as a result of the simulation study
d) All of the above
e)

ANSWERS

1. C.
2. C.
3. A.
4. B.
5. B.
6. C.
7. A.
8. B.

9. B.
10. A.
11. B.
12. A.
13. A.
14. C.
15. B.
16. B.
17. B.
18. B.
19. A.
20. A.
21. B.
22. A.
23. D.
24. A.
25. A.

WEIR

1. How many types of weirs are there based on the shape of the crest?
   a) 6
   b) 4
   c) 5
   d) 3
2. _____ weir comprises several designs into one structure.
   a) All-in-one
   b) Open
   c) Mixed
   d) Compound
3. Triangular weir is also called:
   a) Trigonometric
   b) Ogee
   c) V-notch
   d) Isolated
4. Head loss will be small in case of:
   a) Ogee shaped
   b) Broad crested
   c) Sharp crested
   d) Narrow crested
5. In trapezoidal weir, sides are inclined outward with a slope of:
   a) 1:4
   b) 1:5
   c) 1:6
   d) 1:3
6. Weirs are normally used to calculate:
   a) Volume
   b) Head loss
   c) Discharge
   d) Velocity

7. _____ is the standard shape of a weir.
   a) Rectangular
   b) Triangular
   c) Square
   d) Trapezoidal
8. Cippoletti weir has _____ slope:
   a) Different
   b) Proportionate
   c) Disproportionate
   d) Equal
9. The overflowing sheet of water is called:
   a) Head
   b) Nappe
   c) Upstream
   d) Crest
10. For a discharge of triangular weirs with notch angle _____ the formula is $0.685\ h^{2.45}$.
    a) 90^o
    b) 60^o
    c) 30^o
    d) 45^o
11. Which of the below is suitable for soft sandy foundation?
    a) Dry stone slope weir
    b) Vertical drop weir
    c) Parabolic weir
    d) Masonry slope weir
12. Weirs can be used to power water wheels and power sawmills.
    a) True
    b) False
13. Find the discharge of water flowing over a rectangular notch of 1.5 m length when the constant head over the notch is 275 mm. Take Cd = .60
    a) 400 lit/s
    b) 465 lit/s
    c) 385 lit/s
    d) 575 lit/s
14. The head of water over a rectangular notch is 900 mm. The discharge is 300 litres/s. Find the length of the notch, when CD =.62
    a) .192 m
    b) .250 m
    c) .205 m
    d) .175 m
15. Find the discharge of water flowing over a rectangular notch of 1.3 m length when the constant head over the notch is 255 mm. Take Cd = .62
    a) 400 lit/s
    b) 465 lit/s
    c) 385 lit/s
    d) 575 lit/s
16. The head of water over a rectangular notch is 700 mm. The discharge is 200 litres/s. Find the length of the notch, when CD =.63
    a) .125 m
    b) .265 m

c) .250 m
d) .200 m

17. Find the discharge over triangular notch of angle 50° when the head over the V notch
    a) .93 m^3/min
    b) 1.45 m^3/min
    c) .88 m^3/min
    d) .90 m^3/min
18. The expression for discharge for a right angled notch is more complex than rectangular notch.
    a) True
    b) False
19. The results of which are more accurate; rectangular notch or triangular weir.
    a) Rectangular notch
    b) Triangular weir
    c) Both are equally accurate
    d) Rectangular weir
20. What is main reading required in calculation for rectangular notch or weir.
    a) H
    b) x, x is angle
    c) L
    d) None of the mentioned
21. We need to obligatorily have ventilation in triangular notch.
    a) True
    b) False
22. Rectangular notch may or may not have ventilation.
    a) True
    b) False
23. What is the reduction in crest length due to each end contraction?
    a) 0.1H
    b) 0.2H
    c) 0.15H
    d) 0.25H
24. In Francis formula, the effective length is –
    a) L-0.2H
    b) L-0.4H
    c) L-0.3H
    d) L-0.1H
25. In Francis empirical expression for discharge, the relation between head of water and discharge is
    a) Q is directly proportional to H
    b) Q is directly proportional to $H^{1.5}$
    c) Q is directly proportional to $H^{2.5}$
    d) Q is directly proportional to $H^{0.5}$
26. In Bazin's formula, the discharge is inversely proportional to the length of weir.
    a) True
    b) False
27. The head of water over a rectangular weir is 38 cm. The length of the crest of the weir end contraction suppressed is 1.3 m. Find the discharge using the Francis formula.
    a) 0.56 m^3/s
    b) 0.75 m^3/s
    c) 0.85 m^3/s
    d) 0.69 m^3/s

28. The head of water over a rectangular weir is 28 cm. The length of the crest of the weir end contraction suppressed is 1.27 m. Find the discharge using the Francis formula.
    a) 0.346 m^3/s
    b) 0.556 m^3/s
    c) 0.788 m^3/s
    d) 0.225 m^3/s
29. The head of water over a rectangular weir is 26 cm. The length of the crest of the weir end contraction suppressed is 1.25 m. Find the discharge using the Francis formula.
    a) 0.304 m^3/s
    b) 0.502 m^3/s
    c) 0.350 m^3/s
    d) 0.625 m^3/s
30. The head of water over a rectangular weir is 28 cm. The length of the crest of the weir end contraction suppressed is 1.27 m. Find the discharge using the Francis formula.
    a) 0.346 m^3/s
    b) 0.556 m^3/s
    c) 0.788 m^3/s
    d) 0.225 m^3/s
31. Find the discharge over a cipolletti weir of length 1.5 m when the head over the weir is 0.85 m. Take Cd = 0.61.
    a) 2.12 m^3/s
    b) 1.25 m^3/s
    c) 2.5 m^3/s
    d) 1.5 m^3/s
32. Find the discharge over a cipolletti weir of length 1.3 m when the head over the weir is 0.65 m. Take Cd = 0.60.
    a) 2.12 m^3/s
    b) 1.21 m^3/s
    c) 2.5 m^3/s
    d) 1.5 m^3/s

ANSWERS

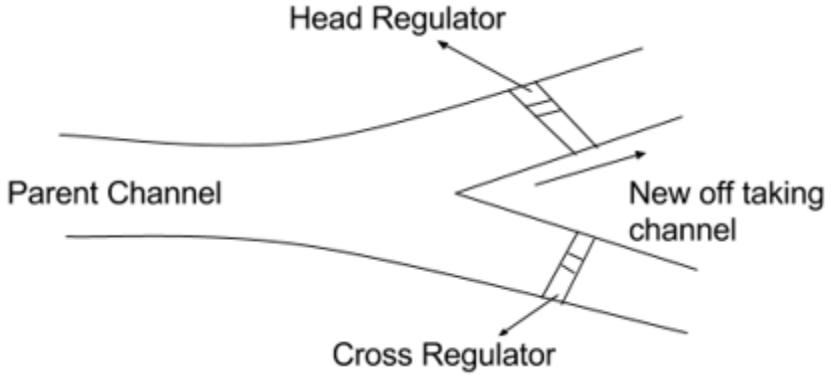
1. B
2. D
3. C
4. B
5. A
6. C
7. A
8. D
9. B
10. C
11. D
12. A
13. C $Q = 2/3 * L * \sqrt{2g} * H^{1.5}$
    $= .67 * 1.5 * \sqrt{19.62} * .275^{1.5}$
    $= .385\ m^3/min.$
14. A $L = 1.5 * Q / (Cd * \sqrt{2g} * H^{1.5})$
    $= 1.5 * .3 / (.62 * \sqrt{19.62} * .9^{1.5})$
    $= .192$ m.

15. A Q = 2/3 * L * √2g * $H^{1.5}$
    = .67 * 1.3 * √19.62 * $.255^{1.5}$
    = .385 m^3/min.
16. A L = 1.5 * Q / (Cd * √2g * $H^{1.5}$)
    = 1.5 * .2 / (.62 * √19.62 * $.7^{1.5}$)
    = .125 m.
17. A Q = 8/15 * √2g * $H^{1.5}$ * tan(x)
    Here, x is the angle.
    = 8/15 * √19.62 * $.22^{1.5}$ * tan(50)
    = .93 m^3/min.
18. B
19. B
20. A
21. B
22. B
23. A
24. A
25. B
26. B
27. A Q = 1.84*L*$H^{1.5}$ = 0.56 m^3/s.
28. A Q = m * L * $(2*g)^{0.5}$ * $H^{1.5}$
    m = ⅔ * Cd
    = 0.405 + 0.003/H
    = 0.405 + 0.003/0.28
    Q = 0.346 m^3/s.
29. A Q = 1.84*L*$H^{1.5}$
    = 0.304 m^3/s.
30. A Q = m * L * $(2*g)^{0.5}$ * $H^{1.5}$
    m = ⅔ * Cd
    = 0.405 + 0.003/H
    = 0.405 + 0.003/0.28
    Q = 0.346 m^3/s.
31. A Q = ⅔ * Cd * L * $(2g)^{0.5}$ * $H^{1.5}$
    = 2.12 m^3/s.
32. B Q = ⅔ * Cd * L * $(2g)^{0.5}$ * $H^{1.5}$
    = 1.21 m^3/s.

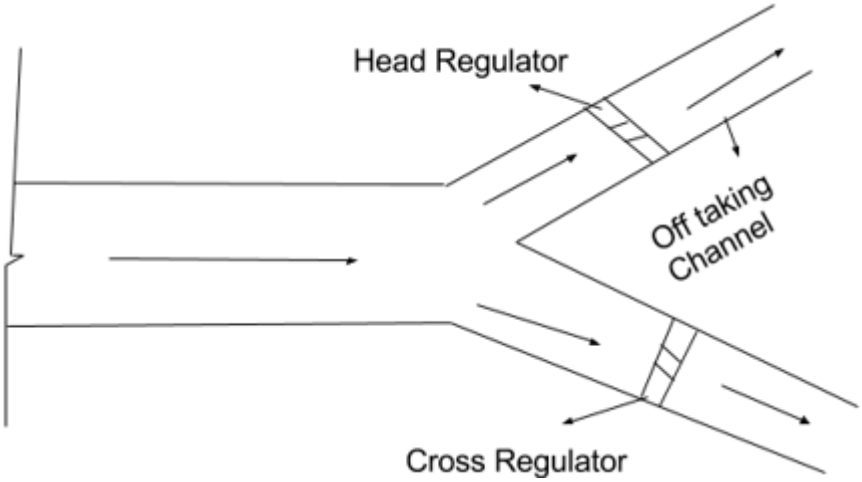
CONTROL STRUCTURE

1. The process of distribution of water from main canal to branches is termed as canal regulation.
a) True
b) False
2. The discharge value of water is controlled by?
a) Hydraulic Jump
b) Falls
c) Regulators
d) Velocity of the flow

3. By using canal regulation works we can control discharges, depths, and velocities in the canals.
a) False
b) True
4. How many types of canal irrigation works are there?
a) 5
b) 4
c) 6
d) 3
5. What is the angle made by this off taking channel with parent channel?

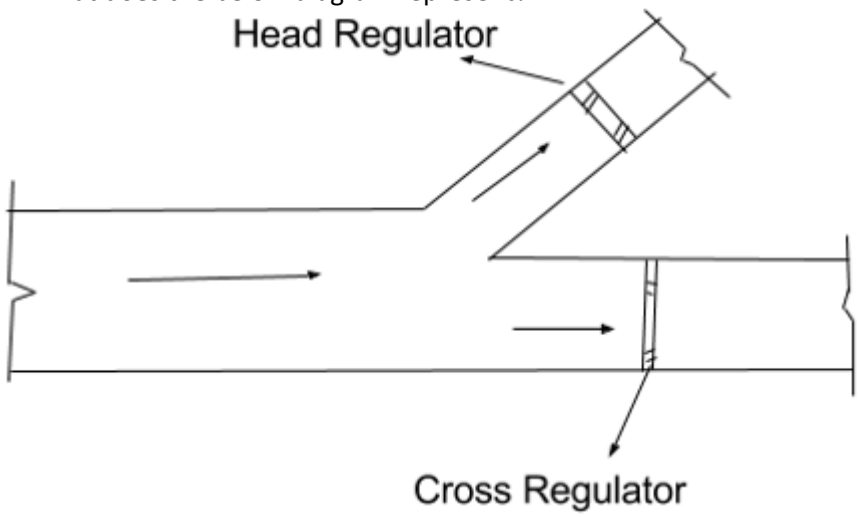


a) 15 degrees
b) Zero degrees
c) 20 degrees
d) 10 degrees
6. When does the alignment depicted by the following diagram used?



a) To Maintain Proper Energy Dissipation
b) To Control Velocity of the Flow
c) To Control Hydraulic Jump
d) To Avoid Silt Accumulation

7. What does the below diagram represent?



a) Undesired Alignment of off taking Channel
b) Parent Channel Carried Straight
c) Off taking Channel making an angle with the Centre of Parent Channel
d) Canal Outlet

8.How many main functions of a head regulator are?
a) 4
b) 1
c) 2
d) 3

9. How many numbers of conditions of flow are to be followed while designing the cross regulator and head regulator?
a) 2
b) 3
c) 4
d) 1

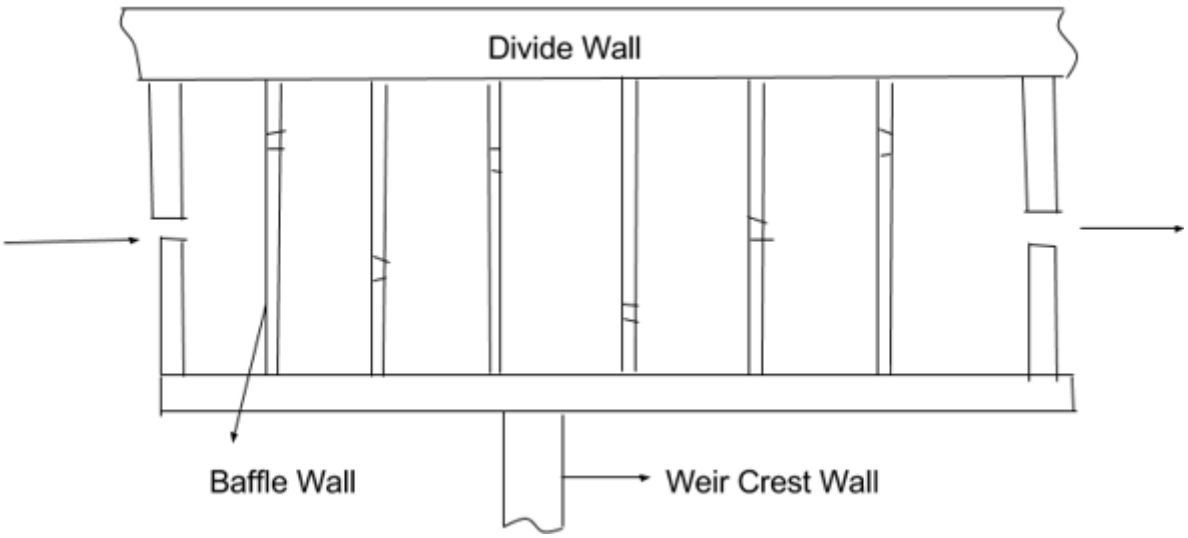
10. By what structures the regulator can control the supplies entering the off take channel?
a) Sluice Gates
b) Falls
c) Piers and Planks
d) Dams

11. The quantity of water that can be diverted from the river into the main canal has no dependency on which of the following factor?
a) The water available in the river
b) The capacity of the main canal
c) Water demand of the branch canals
d) The capacity of the branch canal

12. In case of high demand but insufficient supplies, all the smaller channels are made to run simultaneously and continuously with reduced supplies.
a) True
b) False

13. Which of the following combination is wrong?
a) Roster – Indication of allotted supplies to different channels
b) Flexible regulation – Allocation of supplies with anticipated demand
c) Head regulator – Regulation of discharge in the canal
d) Chak – Command area of an inlet

14. Which of the following characteristics is wrong about extensive irrigation?
a) The irrigation extends to a large area with the lowest available supply
b) Agricultural production and protection against famine will be at optimum levels
c) The crop production will be minimal per unit of available water
d) It creates a perpetual scarcity of water
15. What are the categories of the entire water conveyance system?
a) The primary distribution system and secondary distribution system
b) The primary distribution system, the secondary distribution system, and Water allowance
c) The primary distribution system, secondary distribution system, and tertiary distribution system
d) The primary distribution system, secondary distribution system, tertiary distribution system, and Water allowance
16. Which of the following statement is wrong?
a) The primary and secondary distribution system is fully controlled by the State Irrigation Department
b) The tertiary system is managed by farmers
c) The distribution of water managed by farmers is done on a seven-day rotation basis
d) Water allowance is not a compromise between the likely demand and the supply for a given project
17. Into how many components the diversion headwork is divided?
a) 8
b) 5
c) 4
d) 7
18. In order to find the proper location for the head works on the river, the river is divided into how many stages?
a) 5
b) 2
c) 3
d) 4
19. What does the diagram represent?



a) Divide Wall
b) Plan of Fish Ladder
c) Scouring Sluices
d) Canal Head Regulator
20. Divide wall helps in concentrating scouring action.
a) True
b) False

21. Head regulator helps in controlling the flow in the canal.
a) False
b) True
22. By constructing which structure we can help the fish in their migration?
a) Scouring Sluices
b) Silt Excluder
c) Fish Ladder
d) Divide Wall
23. What device is placed in front of head regulator for silt removal?
a) Weir
b) Silt Extractor
c) Silt Excluder
d) Barrage
24. Which device is used for silt removal after it enters the canal?
a) Silt Excluder
b) Silt Ejector
c) Weir
d) Barrage
25. Depending on how many considerations the capacity of under sluices is fixed?
a) 5
b) 4
c) 2
d) 3
26. How many river training works are needed on the canal head works?
a) 5
b) 3
c) 4
d) 2

ANSWERS

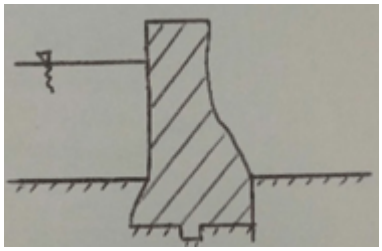
1.A
2.C
3.B
4.A
5.B
6.D
7.B
8.D
9.A
10.C
11.D
12.B
13.D
14.C
15.C
16.D
17.A
18.D
19.B
20.A
21.B

22.C
23.C
24.B
25.D
26.B

DAMS

1. Based on the volume of fill which is the largest man-made dam in the world?
   a) Tarbela Dam
   b) Fort Peck Dam
   c) Ataturk Dam
   d) Houtribdijk Dam
2. The era of large dams was initiated with the construction of which dam?
   a) Hoover Dam
   b) Tarbela Dam
   c) Tehri Dam
   d) Aswan Low Dam
3. The earliest known dam is_____
   a) Jawa Dam
   b) Sadd – el – Kafara Dam
   c) Great Dam of Marib
   d) Roman Dam
4. Which of the following types of dams were widely used in the early part of the industrial revolution?
   a) Steel dams
   b) Timber dams
   c) Coffer dams
   d) Check dams
5. The tallest dam in the world is_____
   a) Jinping- I – Dam
   b) Nurek Dam
   c) Xiaowan Dam
   d) Xiluodu Dam
6. The glacier blocks a river in the dam is known as_____
   a) Ice dam
   b) Blockage dam
   c) Spilt dam
   d) Isolated dam
7. Portion of dam in contact with ground at downstream side is _____
   a) Crest
   b) Toe
   c) Foot
   d) Heel
8. Based on function of dam, it can be classified into:
   a) 5
   b) 8
   c) 10
   d) 6

9. The cross section below shows a



a) Earth
b) Buttress
c) Gravity
d) Arch

10. Hydroelectric power plants at dam supplies about _____ of world's electricity.
a) 19%
b) 25%
c) 42%
d) 50%

11. Buttress dams are of _____ types.
a) 6
b) 4
c) 8
d) 3

12._____ is a temporary dam constructed to exclude water from a specific area.
a) Debris dam
b) Diversion dam
c) Coffer dam
d) Storage dam

13. Based on material of construction, _____ types are there.
a) 2
b) 4
c) 6
d) 8

14. Earth dams are _____ in shape.
a) Triangular
b) Rectangular
c) Trapezoidal
d) Circular

15. When constructing a dam, the bottom of the dam is thicker than the top of the dam. The necessity of having a thick bottom is a result of
a) The volume of the water behind the dam.
b) the altitude of the body of water behind the dam.
c) The depth of the water behind the dam.
d) The community surrounding the dam.

16. A solid barrier constructed at a suitable location across a river valley to impound water is called _____
a) Reservoir
b) Dam
c) Bridge
d) Retaining wall

17. Which among the following is not an objective for the construction of the dam?
    a) To make sure rains occur periodically
    b) Generation of hydropower energy
    c) Providing water supply for domestic and industrial purposes
    d) Providing irrigational facilities
18. The criteria to classify a dam as a large dam is _____
    a) Length of the crest of the dam lesser than 500 m
    b) Capacity of the reservoir less than 1 million cubic meters
    c) Maximum flood discharge less than 2000 cubic meters/second
    d) Capacity of the reservoir not less than 1 million cubic meters
19. Which type of dam usually has a triangular profile and can resist the forces by its own weight?
    a) Gravity dam
    b) Arch dam
    c) Geotechnical dam
    d) Embankment dam
20. What is very critical about gravity dams?
    a) Strength of the concrete used
    b) Strength of the masonry used
    c) Strength of the rock foundation
    d) The type of water stored in the reservoir
21. Type of dam where the forces acting on the dam are transmitted onto the abutment rocks is _____
    a) Gravity dam
    b) Arch dam
    c) Geotechnical dam
    d) Embankment dam
22. Which type of dam cannot be constructed even on the rock foundations which are not sufficiently strong enough?
    a) Gravity dam
    b) Arch dam
    c) Geotechnical dam
    d) Embankment dam
23. Oldest dam in Iraq is _____
    a) Mosuol dam.
    b) Dokan dam.
    c) Darbandikhan dam.
    d) Duhok dam.
23. Biggest force acting on gravity dams is _____
    a) Uplift pressure.
    b) Wave pressure.
    c) Earthquake force.
    d) Weight of the dam.
25. The maximum compressive stresses occur at toe when the reservoir is _____
    a) Empty.
    b) Full.
    c) Half.
    d) None of above.

Answers:

1. Answer: a
   Explanation: Tarbela Dam is the largest man-made dam in the world. It is located in Pakistan. The construction of a dam is completed in 1976. Fort Peck Dam, Ataturk Dam, Houtribdijk Dam are respectively second, third and fourth largest man-made dams.
2. Answer: d
   Explanation: The era of large dams was initiated with the construction of the Aswan Low dam. It is located in Egypt and built in 1902. It is gravity masonry buttress dam on the Nile river.
3. Answer: a
   Explanation: Jawa Dam is the earliest known dam. Jawa dam which is in Jordan, 100 km away from the capital Amman. This earliest built dam Jawa is a gravity dam. This dam structure is dated to 3000 BC. This Jawa dam is still in use.
4. Answer: b
   Explanation: Timber dams were widely used in the early part of the industrial revolution. This is due to the ease and speed of construction. Two common variations of timber dams are a crib and the plank. Both these variations have different functions.
5. Answer: a
   Explanation: Jinping- I – dam is the tallest dam in the world. It's is of 305m in height. It is a concrete arch type dam. It is situated in China and the river that flows in this dam is Yalong. Nurek Dam, Xiaowan Dam and Xiluodu Dam are second, third, fourth tallest dams respectively.
6. Answer: a
   Explanation: An Ice dam occurs when water builds behind a blockage of ice. Ice dams form either when ice chunks in a river and forms a lake or when ice chunks in a river are blocked by something and build up to form a dam.
7. Answer: d
   Explanation: Toe is the position of a dam in contact with the ground at the upstream side. Crest is top of dam. There is no part called a foot.
8. Answer: a
   Explanation: The five types are storage, diversion, detention, debris and coffer dams.
9. Answer: c
   Explanation: The figure shows a gravity dam. It is a massive sized dam built using concrete or stone masonry. They can hold back large volume of water.
10. Answer: a
    Explanation: It also contributes to over 63% of renewable energy. Most of this is generated by China (large dams) and contributes about 50% of world use of the power generated.
11. Answer: d
    Explanation: The three types of buttress dam are deck type, multiple-arch type and massive-head type. Deck type consists of a sloping deck supported by buttresses. In massive-arch type, deck is replaced by horizontal arches. There is no deck slab in massive-head type.
12. Answer: c
    Explanation: Coffer dam is constructed on the upstream side of the site where a dam is to be constructed, so that site is dry.
13. Answer: a
    Explanation: There are two types – rigid and non-rigid. Rigid material includes steel, concrete, masonry, stone, etc. and non-rigid materials are earth (earth dam), tailings (waste from mine), rock fill (rock).
14. Answer: c
    Explanation: Earth dams are generally built using gravel, sand and clay. They are trapezoidal in shape so as to hold the non-rigid materials properly.

15. Answer: c
16. Answer: b
    Explanation: A dam may be defined as a solid barrier constructed at a suitable location across a river valley with a view of impounding water flowing through that river.
17. Answer: a
    Explanation: Dams are constructed for achieving any one or more of the following objectives: generation of hydropower energy; providing water for irrigation facilities; providing water supply for domestic and industrial purposes; fighting droughts and controlling of floods; providing navigational facilities.
18. Answer: d
    Explanation: Following conditions are necessary to classify a dam as large dams: length of the crest of the dam not lesser than 500 m; capacity of the reservoir not less than 1 million cubic meters; maximum flood discharge not less than 2000 cubic meters/second.
19. Answer: a
    Explanation: A gravity dam is a solid masonry or concrete structure, generally of a triangular profile, which is so designed that it can safely stand against a pre-calculated volume of water by virtue of its own weight.
20. Answer: c
    Explanation: All the forces arising in a gravity dam as due to the thrust of the impounded water and the massive weight of the dam material- are assumed to be directly transmitted to the foundation rocks. Hence the strength of the foundation rocks is the most critical factor.
21. Answer: b
    Explanation: An arch dam, as the name implies, is an arch-shaped solid structure mostly of concrete, which is designed in such a way that a major part of the thrust forces acting on the dam are transmitted mainly by the arc action, on to the abutment rocks.
22. Answer: a
    Explanation: Both the arch dams and the embankment dams can be constructed on the rock foundations which sufficiently strong enough, whereas, the gravity dams are constructed only on strong rock foundations.
23. Answer: b.
    Explanation: Dukan Dam is located on Zab Al Kabeer River within the Sulaymaniyah Governorate in northern Iraq, located 60 km northwest of the city of Sulaymaniyah and 100 km from the city of Kirkuk, and it is a curved concrete dam with a radius of 120 meters and a length of 360 meters. Construction of the dam began in 1954 and it was completed in 1959, and it is the first dam in Iraq.
24. Answer: c.
    Earth quick force considered as a biggest force acting on dams.
25. Answer: b.
    Explanation: when the savior is full, highest pressure will apply on toe.

ENERGY DISSIPATION

1- The energy dissipation at the toe of the spillway is affected basically by the use of hydraulic jump in _____

a) roller bucket
b) a ski-jump bucket
c) a sloping apron below the downstream river bed
d) both roller and ski-jump bucket.

2- When the tail-water depths in the river downstream of a spillway are quite low such that the tail-water curve at all discharges lies below the post jump depth curve, then the energy dissipation can be affected best by _____
   a) a roller bucket
   b) a ski-jump bucket
   c) either roller or ski-jump bucket
   d) a sloping apron
3- The device which does not help in energy dissipation at the bottom of a hydraulic structure over which water spills is _____
   a) chute block.
   b) dentated sill.
   c) morning glory.
   d) baffle piers.
4- The formation of hydraulic jump at the foot of a spillway is one of the common methods of energy dissipation because _____
   a) it destroys more than 90% of total energy by the turbulence produced in the jump
   b) it reduces the kinetic energy by increasing the depth of flow
   c) its action is not understood
   d) it reduces the kinetic energy by decreasing the depth of flow.
5- A ski-jump bucket is also known as _____
   a) flip bucket
   b) solid roller bucket
   c) slotted roller bucket
   d) flexible bucket
6- The percentage of energy dissipation in a hydraulic jump increases with the increase in the Froude number.
   a) True
   b) False
7- Which of the following stilling basin help in stabilizing the flow and improve the jump performance?
   a) dentated sills
   b) chute blocks
   c) baffle piers
   d) friction blocks
8- A troublesome and oscillating hydraulic jump is normally met in cases of _____
   a) weirs and barrages.
   b) overflow spillways of dams.
   c) weirs.
   d) large spillways.
9- A very steady and stable hydraulic jump is usually formed in the flows involving the approaching Froude number in the range of _____
   a) less than 2.5
   b) 2.5 to 4.5
   c) 4.5 to 9.0
   d) more than 9.0
10- Standard USBR stilling basin-II is useful for energy dissipation at the bottom of the overflow structure, if the approaching Froude number is _____
   a) less than 4.5
   b) more than 4.5
   c) less than 2.5
   d) more than 2.5

11- When the Froude number is in the range of 2.5 to 4.5, the jump is _____
a) weak and energy loss is low
b) troublesome and oscillating
c) steady jump
d) strong jump

12- Which of the following stilling basin is applicable to only rectangular cross-sections?
a) U.S.B.R stilling basin-II
b) U.S.B.R stilling basin-IV
c) U.S.B.R stilling basin-I
d) U.S.B.R stilling basin-III

13- The Froude number of a hydraulic jump is 5.5. The jump can be classified as _____
a) a weak jump
b) an oscillating jump
c) rough and choppy jump
d) steady jump

14- Standard stilling basin is provided at the toe of a dam spillway for energy dissipation is usually provided with auxiliary devices like chute blocks and dentated sills for the basic purpose of reducing the length of the stilling basin from about _____
a) 6 y_2 to 4 y_2
b) 4 y_2 to 2 y_2
c) 6 y_2 to 2 y_2
d) 3 y_2 to y_2

15- In the case of dam spillways, the approaching Froude number usually lies in the range of _____
a) less than 2.5 m
b) 2.5 – 4.5
c) 4.5 – 9.0
d) more than 9.0

16- _____ are suitable only for low spillways or weirs.
a) Chute blocks
b) Sloping aprons
c) Baffle wall or friction blocks
d) Roller buckets

17- Which of the following helps in dissipating the residual energy and to reduce the length of the jump or the basin?
a) Dentated sills
b) Chute blocks
c) Roller bucket
d) Baffle piers

18- Hydraulic jump is observed in _____
a) Closed channel flow
b) Open channel flow
c) Flow changes
d) Volumetric changes

19- Hydraulic jump depends upon_____
a) Temperature
b) Pressure
c) Initial fluid speed
d) Volumetric changes

20- When the hydraulic jump is in a moving form it is called _____
a) Negative surge

b) Positive surge
c) Turbulent surge
d) Accelerated surge

21- Fluid height before the hydraulic jump is _____
a) Normal
b) Low
c) High
d) Zero

22- During a subcritical flow, what is the value of Froude's number?
a) Zero
b) Greater than one
c) Less than one
d) Not defined

23- In which case is the hydraulic jump not possible?
a) Initial speed > critical speed
b) Initial speed < critical speed
c) Initial speed = critical speed
d) Independent

24- Fluid speed before the hydraulic jump is _____
a) Critical
b) Supercritical
c) Subcritical
d) Dynamic.

25- Fluid height after the hydraulic jump is _____
a) Normal
b) Low
c) High
d) Zero

Answers:

1. Answer: c
   Explanation: Most of the kinetic energy is destroyed by creating a condition suitable for the formation of a hydraulic jump. Sometimes the depth of tail-water may be more than that necessary to create the hydraulic jump. The depth of water can be reduced to create a hydraulic jump by providing a sloping apron.
2. Answer: b
   Explanation: Energy dissipation bucket called ski-jump bucket is used when the tail-water depth is insufficient or low at all discharge. It requires sound and rocky river bed. Water may shoot up out of the bucket and fail harmlessly into the river at some distance downstream of the bucket.
3. Answer: c
   Explanation: A flared inlet called morning glory is often used in large projects. The horizontal tunnel is either taken through the dam body or below the foundations. Chute blocks, dentated sills and baffle piers are all auxiliary devices which help in energy dissipation.
4. Answer: a
   Explanation: Hydraulic jump is generally accompanied by large scale turbulence dissipating most of the kinetic energy of the super-critical flow. It is the most suitable method because the energy is lost in the impact of the water against water. Most of the kinetic energy is destroyed by creating a condition suitable for the hydraulic jump.
5. Answer: a
   Explanation: A ski-jump bucket is also called flip bucket is used for energy dissipation when

tail-water depth is insufficient or low at all discharge. A part of energy dissipation takes place by impact and some of the energy is dissipated in the air by diffusion or aeration.

6. Answer: a
   Explanation: The energy dissipation in the jump depends upon the Froude number, if this Froude number is higher, the greater energy dissipation can take place.

S NO.	Froude number	% loss in energy
1.	2.5	17
2.	4.5	45
3.	9.0	70

7. Answer: b
   Explanation: Chute blocks are a row of small projections like teeth of saw and are provided at the entrance of the silting basin. It produces a shorter length of jump and stabilizes the flow. Hence, they improve jump performance.
8. Answer: a
   Explanation: When the Froude number lies in the range of 2.5 to 4.5, the jump is troublesome and oscillating as in case of weirs and barrages. There is an oscillating jet entering the jump bottom to the surface and back again which produces a large wave of irregular period doing unlimited damage.
9. Answer: c
   Explanation: When the Froude number is in the range of 4.5 to 9.0, the jump performs at its best and is called steady jump. The length of the jump is almost constant and equal to 6 y_2 where y_2 is the post jump depth. The dissipation of energy ranges from 45 to 70%.
10. Answer: b
    Explanation: USBR has standardized stilling basins for different Froude numbers. USBR stilling basin- II is recommended for large structures when the Froude number is more than 4.5. The dissipation of energy will be 45 to 85%.
11. Answer: b
    Explanation: When the Froude number is in the range of 2.5 to 4.5, the jump is troublesome and oscillating. This gives rise to the heavy waves on the surface and wave suppressors are needed in this range.
12. Answer: b
    Explanation: USBR stilling basin-IV is used for Froude number varying between 2.5 and 4.5 which generally occurs in canal weirs, canal falls, diversion dams, etc. They are tried to be controlled by providing large chute blocks since oscillating waves are generated in this range. This is applicable only to rectangular cross-sections.
13. Answer: d
    Explanation: When the Froude number is in the range of 4.5 to 9.0, the jump is steady. This is generally the case of dams and spillways. The oscillating jump occurs between the range of 2.5 to 4.5 and when Froude number is less than 2.5, the jump is weak and when it is more than 9.0, the jump is rough and choppy.
14. Answer: a
    Explanation: In the case of dams and spillways, the jump is steady and the length of the jump is almost constant and is equal to 6 y_2 where y_2 is the post jump depth. The length of the basin is related to Froude number as the economy in the length of the basin up to about 35% i.e. 4.3 y_2 is thus obtained for auxiliary devices.
15. Answer: c
    Explanation: Froude number varying between 2.5 and 4.5 generally occurs in canal weirs, canal falls, diversion dams, etc. For dams and spillways, the Froude number is in between 4.5 and 9.0 i.e. steady jump and the jump is well balanced.
16. Answer: c
    Explanation: Baffle piers or walls are blocks placed within the basin across the basin floor

and they help in breaking the flow and dissipate the energy mostly by the impact. They generally give away under high-velocity jets due to their cavitation effects. It is unsuitable for large works.

17. Answer: a
    Explanation: Chute blocks help in stabilizing the flow and thus improve the jump performance. Baffle piers help in breaking the flow and dissipate energy mostly by the impact. Dentated sills are generally provided at the end of the stilling basin and diffuse the residual portion of high-velocity jet reaching the end of the basin
18. Answer: b
    Explanation: Hydraulic pump is a phenomenon in science that deals with hydraulics. It is observed in an open channel flow. Some of the examples of open channel flows are rivers and spillways.
19. Answer: c
    Explanation: Hydraulic pump is a phenomenon in science that deals with hydraulics. It is observed in an open channel flow. It depends on the initial speed of the fluid. Thus, option Initial fluid speed is the correct answer.
20. Answer: b
    Explanation: When the hydraulic jump is dynamic or in a moving form it is called as positive surge. Hydraulic jump can be stationery or dynamic. Hydraulic jump can be described using the same analytical approaches.
21. Answer: b
    Explanation: Hydraulic jump is not possible when the initial speed is less than the critical speed. There is a transition that is created during the change. The transition appears as an undulating wave. Fluid height before the hydraulic jump is low.
22. Answer: c
    Explanation: Subcritical depth occurs when actual water depth is greater than the critical depth. It is dominated by gravitational forces and behaves in a slow and stable way. The Froude's number is less than one during a subcritical flow.
23. Answer: b
    Explanation: Hydraulic jump is not possible when the initial speed is less than the critical speed. There is a transition that is created during the change. The transition appears as an undulating wave. With the increase in the initial flow, the transition becomes abrupt.
24. Answer: b
    Explanation: Fluid speed before the hydraulic jump is supercritical. It is said to be supercritical because it is faster than the wave speed. It is also called as shooting speed or supernal.
25. Answer: c
    Explanation: Hydraulic jump is not possible when the initial speed is less than the critical speed. There is a transition that is created during the change. The transition appears as an undulating wave. Fluid height after the hydraulic jump is high.

RESERVOIRS

1. A dam reservoir, not provided with gate controls on its spillway and other sluices, is called a :
   (a) detention basin (b) storage reservoir (c) retarding basin (d) all of these.
2. A dam reservoir, catering to flood control, irrigation, and water supply, although basically designed for irrigation alone, is a :
   (a) multipurpose reservoir (b) single purpose reservoir (c) distribution reservoir (d) none of the above.

3. A hydel power project has been envisaged to serve the water. Supply and irrigation needs of the area at its inception stage. The dam reservoir, so constructed, will be known as:
   (a) Multipurpose reservoir (b) Single purpose reservoir (c) Both (a) and (b) above (d) none of the above.
4. The 'surcharge storage' in a dam reservoir is the volume of water stored between: ·
   (a) minimum and maximum reservoir levels (b) minimum and normal reservoir levels (c) normal and maximum reservoir levels (d) none of the above.
5. The 'useful storage' in a dam reservoir is the volume of water stored between: (a) minimum and maximum reservoir levels (b) minimum and normal reservoir levels (c) normal and maximum reservoir levels (d) none of the above.
6. The 'dead storage' in a dam reservoir, is the available volume for collection of silt and sediment, between :
   (a) bed level of the reservoir and minimum reservoir level
   (b) bed level of the reservoir and the silt level in the reservoir
   (c) bed level of the reservoir and the normal pool level (d) none of the above.
7. 'Bank storage' in a dam reservoir :
   (a) increases the computed reservoir capacity
   (b) decreases the computed reservoir capacity
   (c) sometimes increases and sometimes decreases the computed reservoir capacity (d) has no effect on computed reservoir capacity.
8. The water stored in a reservoir below the minimum pool level is called :
   (a) valley storage (b) bank storage
   (c) surcharge storage (d) dead storage.
9. For a flood control reservoir, the effective storage is equal to :
   (a) useful storage + valley storage
   (b) useful storage+ surcharge storage.- valley storage (c) useful storage + surcharge storage + valley storage (d) useful storage - valley storage.
10. The volume V of water stored in a reservoir in a depth y above a given datum, can be easily represented -by an equation of the type·:
    (a) $V = [a + \beta y + \gamma y^2]$ where: α , β, γ are constants
    (b) $V = [ay + \beta y^2 + \gamma y^3] + K$ K: is reservoir capacity up to given datum (c) neither (a) nor (b).
    (d) both (a) and (b).
11. Average yield of a storage reservoir is the arithmetic average of its :
    (a) firm yields over a long-period
    (b) secondary yields over a long period (c) firm and secondary yields over a long period (d) none of the above.
12. If A_1 and A_2 are surveyed and known areas at a reservoir site at elevations of E_1 and E_2, respectively; then the area, A, at any intermediate elevation E, is interpolated as :
    (a) $\sqrt{A} = \sqrt{A_1} + \frac{E-E_1}{E_2-E_1}(\sqrt{A_2} - \sqrt{A_1})$
    (b) $\sqrt{A} = \sqrt{A_1} + \frac{E-E_1}{E_2+E_1}(\sqrt{A_2} - \sqrt{A_1})$
    (c) $\sqrt{A} = \sqrt{A_1} + \frac{E-E_1}{E_2-E_1}(\sqrt{A_2} - \sqrt{A_1})^2$
    (d) none of the bove.
13. While planning a water supply reservoir, as compared to an irrigation reservoir, the design yield may be kept :
    (a) higher (b) lower (c) equal (d) lower or higher, as per designer's discretion.
14. Yield of a reservoir represents :

(a) the inflow into the reservoir (b) the capacity of the reservoir (c) the-Outflow demands on the reservoir (d) none of the above.

15. The capacity of a storage reservoir can be decided by using :
(a) the mass curve of inflow (b) the mass curve of outflow (c) by both (a) and (b) together (d) none of the above.

16. The maximum quantity of water that is estimated to remain available in a storage reservoir for supply; even during worst dry periods, is known as its:
(a) firm yield (b) design yield (c) reservoir yield (d) primary yield.

17. Design yield of a storage reservoir is kept:
(a) higher than its firm or safe yield (b) lower than its firm or safe yield (c) equal to its firm or safe yield (d) higher or lower than the firm yield, depending upon the designer's intuition.

18. The amount of water stored in a river channel without any artificial storage, is known as :
(a) bank storage (b) river storage (c) valley storage (d) dead storage.

19. With the reduction in reservoir capacity over the passage of time, the trap efficiency
(a) increases (b) decreases (c) remains unaffected (d) may increase or decrease, depending upon the reservoir characteristics.

20. Trap efficiency of a storage reservoir is defined as : Total annual sediment inflow
(a) Total annual sediment in flow / Reservoir capacity
(b) Total sediment deposited in a given period / Total sediment inflow in that period (c) Total annual sediment deposited in the reservoir / Dead storage capacity of the reservoir
(d) none of the above,·

21. Capacity-inflow ratio for a storage reservoir is defined as:·
(a) reservoir capacity / average annual flood inflow
(b) reservoir capacity / average annual sediment inflow
(c) dead storage capacity of the reservoir / average annual sediment deposited (d) none of the above.

22. With the increase in its capacity-inflow ratio, the trap efficiency of a reservoir:
(a) increases · (b) decreases (c) remains unchanged
(d) may increase or decrease depending on the reservoir characteristics.

23. The capacity-inflow ratio for a reservoir :
(a) is a constant factor ove (b) increases with time
(c) decreases with time· (d) may increase or decrease with time.

24. As the height of a proposed dam is increased, the cost per unit of storage : (a) increases (b) decreases (c) initially increases and then decreases (d) initially decreases and then increases.

25. "Economical height of a Dam" is that height, for which the :
(a) cost per unit of storage is minimum (b) benefit cost ratio is maximum (c) net benefits are maximum (d), none of the above.

Answer of questions

1	c	6	c	11	c	16	d	21	b
2	a	7	c	12	c	17	b	22	b
3	b	8	b	13	a	18	c	23	b

4	d	9	b	14	b	19	a	24	b
5	b	10	c	15	a	20	a	25	c

TRANSITION STRUCTURES

1- Hydraulic depth is the ratio of :
- *(a)* wetted area to wetted perimeter
- *(b)* wetted area to top width (c) wetted area to bottom width

(d) wetted perimeter to top width.

2- All transitions may be classified as either contraction or expansion. However , the transitions can be classified according to a state of flow through
- *(a)* Transition from subcritical to another subcritical flow
- *(b)* Transition from subcritical to supercritical flow
- *(c)* both (a) and (b)
- *(d)* none of all

3- The contracting transition should be tangential to the wall at throat (contracted section) where velocity is

(a) high (b) low (c) uniform (d) steady

4- Various types of transitions can be used to connect between channels when vary in cross sections and shapes is need. The engineer to be select an appropriate type according to the following :-
- *(a)* Important
- *(b)* Economy
- *(c)* Amount of head loss needs
- *(d)* all of these

5- The flow characteristics of a channel do not change with time at any point. What type of flow is it? (a) Steady flow
- *(b)* Uniform flow
- *(c)* Laminar flow
- *(d)* Turbulent flow

6- Contracting and expanding transitions with free water surface are provided to perform one or more of the following functions:
- *(a)* To minimize loss in head within the transition.
- *(b)* To prevent flow separation from boundaries.
- *(c)* To achieve normal and smooth flow conditions before, within, and after the flumed structure
- *(d)* All of these

7- Transitions may be of different shapes:
- *(a)* linear,
- *(b)* circular,
- *(c)* wedge shaped,
- *(d)* all of these

8- Transition from supercritical to subcritical flow without any jump is theoretically possible by providing a streamlined wedge-shaped structure such that

(a) the specific energy changes gradually

(b) there is flow separation from the boundary

(c) the specific energy not change (d) none of the above.

9- Transition from subcritical to supercritical flow takes place when

(a) the specific energy changes gradually

(b) the incoming subcritical flow gets choked

(c) there is no flow separation from the boundary (d) all of these

10- Suitable transitions are needed for spillways in dams and weirs to

(a) prevent the separation of flow

(b) change the flow from supercritical to subcritical

(c) change the flow from subcritical to supercritical flow

(d) kept the flow uniform

11- The design of transitions in a supercritical transition aims at suppressing or at least reducing the shock waves in order to

(a) Make the flow uniform

(b) Avoid flow concentrations

(c) Provide adequate freeboard in structures

(d) All of these

12- In the subcritical contracting transition, pressure energy is converted to

(a) Head losses

(b) Potential energy

(c) Kinetic energy

(d) All of these

13- The efficiency of transitions is governed by the following nondimensional parameters:

(a) Froude's number

(b) Average side splay

(c) Fluming ratio

(d) All of these

14- An optimum axial length of contracting transition for achieving:

(a) the highest velocity and minimum losses of head

(b) the highest energy and minimum losses of head

(c) the highest efficiency and minimum losses of head

(d) none of the above

15- Specific energy (E) in open-channel flow is defined as the energy measured above channel bed:

(a) $E = y - \alpha \frac{V^2}{2g}$

(b) $E = y^2 + \alpha \frac{V^2}{2g}$

(c) $E = y^2 - \alpha \frac{V}{2g}$

(d) $E = y + \alpha \frac{V^2}{2g}$

16- The efficiency of expansion had been defined as

(a) ratio of actual recovery of head to the total loss of friction

(b) ratio of actual recovery of head to the total loss of kinetic energy

(c) ratio of actual recovery of head to the total loss of hydrostatic pressure. (d) none of the above

17- The axial length of inlet transition is found such that a straight line joining the flow lines at the two ends of the transition will make an angle of (a) 12.5° with the axis of the structure.

(b) 12.0° with the axis of the structure.

(c) 10.5° with the axis of the structure.

(d) 5.12° with the axis of the structure.

18- For the most economical trapezoidal open channel,

(a) half of the top width must be equal to one of the sloping sides

(b) the hydraulic mean depth must be equal to half the depth of flow

(c) the semicircle drawn with top width as diameter must touch the three sides of the channel

(d) All of these.

19- Total head of a liquid particle in motion is the sum of

(a) potential head and kinetic head

(b) kinetic head and pressure head

(c) potential head and pressure head

(d) Potential head, kinetic head and pressure head.

20- Hydraulic gradient is equal to difference in water surfaces (a)

(b) $\frac{\text{difference in water surfaces}}{\text{total length of the channel}}$

(c) $\frac{\text{head loss due to friction}}{\text{total length of the channel}}$

(d) $\frac{\text{wetted perimeter}}{\text{total length of the channel}}$

$\frac{\text{area of the cross-section}}{\text{total length of the channel}}$

21- For critical depth of flow of water in open channels, fc the specific energy must be :

(a) Minimum

(b) Maximum

(c) average of maximum and minimum (d) None of these.

22- If the forces are due to inertia and gravity, and frictional resistance plays only a minor role, the design of the channels is made by comparing

(a) Reynold number

(b) Froude number

(c) Weber number (d) Mach number.

23- Hydraulic radius is equal to

(a) area divided by the square of wetted perimeter

(b) area divided by wetted perimeter

(c) wetted perimeter divided by area (d) square root of the area.

24- Hydraulic grade line

(a) remains above the center line of conduit

(b) remains below the center line of conduit (c) remains parallel to the center line of conduit
(d) may be above or below the center line of conduit.

25- The minimum specific energy of flow of water in open channel is : (where h_c is the critical depth)

(a) h_c
(b) $\frac{h_c}{2}$
(c) $\frac{3h_c}{2}$
(d) $\frac{2}{3}h_c$

Answer of questions

1	b	6	d	11	d	16	b	21	a
2	c	7	d	12	c	17	a	22	b
3	a	8	a	13	d	18	d	23	b
4	d	9	b	14	c	19	b	24	d
5	a	10	a	15	d	20	b	25	c

OPEN CHANNEL FLOW

1. Under which of the following conditions steady non-uniform flow in open channels occurs?
   a. When for a constant discharge the liquid depth in the channel varies along its length
   b. When a constant discharge flows at the constant depth
   c. When a constant discharge flows in a channel laid at a fixed slope
   d. When the discharge and the depth both vary along the channel length

   Ans(a)
2. When the depth of flow changes gradually over a length of the channel, then the flow will be termed as
   a. Rapidly varied flow
   b. Critical flow
   c. Gradually varied flow
   d. Uniform flow

   Ans(c)
3. Non-uniform flow may caused by
   a. The change in width, depth, bed slope etc. of the channel
   b. An obstruction, across a channel of uniform width
   c. None of the above.
   d. Both (a) and (b)

Ans(d)

4. The phenomenon occurring in an open channel when a rapidly flowing stream abruptly changes to slowly flowing stream causing a distinct rise of liquid surface, is
   a. Uniform flow
   b. Critical discharge
   c. Hydraulic jump
   d. None of the above

   Ans(c)
5. The channel whose boundary is not deformable is known as
   a. Rigid channel
   b. Prismatic channel
   c. Mobile channel
   d. Boundary channel

   Ans(a)
6. Find at the discharge in a trapezoidal channel with a bed width of 10m, side slope of 1:1 and depth of flow of 2.0m under uniform flow condition. The bottom slope of 0.0001 and n=0.02. Also, find the Chezy's coefficient at this depth

a) 12 cumec, 52.4 m1/2/s
b) 16 cumec, 52.4 m1/2/s
c) 11cumec, 52.4 m1/2/s
d) 16 cumec, 42.4 m1/2/s
(Ans:b)

7. A rectangular channel has a bed width of 4m, bottom slope of 0.0004 and Manning's n of 0.02. The normal depth of flow in this channel is 2m. If the channel empties into a pool at the downstream and the pool elevation of 0.6m higher than canal bed elevation at the downstream end. Calculate the critical depth of section.

a) 0.542 m
b) 0.642 m
c) 0.242 m
d) 0.742 m
(Ans:d)

8. Find the critical depth and critical velocity of the water flowing thr
ough a rectangular channel of width 8m, when discharge is 20cumecs

a) 0.9 m/s
b) 1.9 m/s
c) 2.9 m/s
d) 3.9 m/s
(Ans:c)

9. For a given triangular channel, section of side slope 2H: 1V, minimum specific energy is 1.5m. Find the corresponding critical velocity.

a) 2.426 m/s
b) 2.326 m/s
c) 0.426 m/s
d) 1.426 m/s
(Ans:a)

10. The discharge of water through a rectangular channel of width 6m is 18 cumecs, when depth of flow of water is 2m. Calculate,

1. Specific energy of flowing water
2. Critical depth and critical velocity
3. Value of minimum specific energy.

a) 1.115m, 0.9716m and 1.457m respectively

b) 2.115m, 0.9716m and 1.457m respectively
c) 2.115m, 0.1716m and 1.457m respectively
d) 2.115m, 0.9716m and 0.457m respectively
(Ans:c)

11. A lined channel of trapezoidal section carries a discharge of 10 cumecs, at a depth of 1.2m , with bottom width 2m and side slope of 1.5 Horizontal to 1Vertical. Consider uniform flow and calculate:

a. The longitudinal slope of the channel.
b. The average shear stress over the wetted perimeter
c. The value of equivalent Darcy's f .
d. The Froude number of flow. Assume, Manning's n= 0.010.

a) 1/1351.4, 5.22N/m2, 0.008, 0.776)
b) . 1/1351.4, 3.22N/m2, 0.008, 0.776)
c) . 1/1351.4, 5.22N/m2, 0.008, 0.176)
d) . 1/1351.4, 5.22N/m2, 0.001, 0.776)
(Ans:a)

12. A rectangular channel 4m wide and bed slope 1 in 5000, conveys a discharge of 5.0 cumecs. The depth of flow at a section is 0.80m. How far upstream will the depth of flow be 1.0m? Assume N=0.012. (Ans.)

a) 161.53m
b) 261.53m
c) 461.53m
d) 361.53m
(Ans:c)

13. For a constant specific energy of 1.0 N-m/N, calculate the maximum discharge that may occur in a rectangular channel, 1.0m wide. (Ans.)

a) 1.91cumec
b) 3.91cumec
c) 2.0cumec
d) 2.91cumec
(Ans: d)

14. A trapezoidal channel has a bottom width of 6m and side slope of 1:1. The depth of the flow is 1.5m; bottom slope is 1 in 1000 and discharge of 15cumec flows through it. Determine the specific energy. Take n=0.015.

a) 3.663m
b) 1.663m
c) 2.663m
d) 4.663m
(Ans:b)

15. In most economical rectangular section of a channel, depth is kept equal to
a. One-fourth of the width
b. Three times the hydraulic radius
c. Hydraulic mean depth
d. Half the width
Ans(d)

16. In a hydraulically most efficient trapezoidal channel section the hydraulic radius R=
a. y/2
b. y/4
c. 2y
d. 4y
Ans(a)

17. Most efficient channel section, is
    a. Trapezoidal
    b. Rectangular
    c. Circular
    d. Half hexagon in the form of trapezoid
    Ans(d)

18. Most economical section of a triangular channel is
a) Equilateral triangle
b) Right angled triangle
c) Isosceles triangle having vertex angle equal to 450
d) Right angled triangle with equal sides
Ans(d)

19. In a hydraulically most efficient trapezoidal channel section the ratio of the bed width to depth is
a) 1.155
b)0.50
c) 0.707
d) 1.10
Ans(a)

20. Most economical section of a circular channel for maximum velocity, is if
a). Depth of water = 0.81 diameter
b). Hydraulic mean depth = 0.304 diameter
c). Wetted perimeter = 2.245 diameter
d). All the above.
Ans(d)

21. A circular channel is proposed to lay on a slope of 1 in 2000 and is required to carry1.5 cumec . What size of circular channel should be used if it has to flow half-full take n=0.015.
a) 4.1m
b) 1.1m
c) 2.1m
d) 3.1m
(Ans:c)

22. A circular sewer of diameter 1m carries storm water to a depth of 0.75m. Compute the hydraulic radius, hydraulic depth and section factor
a) 0.198m, 0.479 and 0.287
b) 0.298m, 0.479 and 0.287
c) 0.398m, 0.479 and 0.287
d) 0.198m, 0.179 and 0.287
(Ans:a)

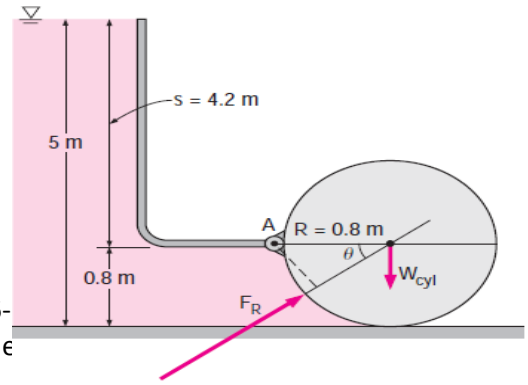
23. A triangular channel with an apex angle of 90° carries a flow of 0.7cumec at a depth of 0.6m. If bed slope is 1 in 100. Find the Manning's roughness of channel.
a) 0.0347
b) 0.0247
c) 0.0147
d) 0.0047
(Ans:c)

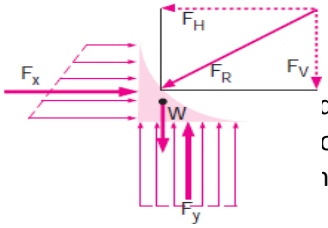
24. A trapezoidal channel is 15m wide and has a side slope 1H: 1V. Bottom slope is 1 in 2500. The channel is lined with smooth concrete having n=0.015. Compute discharge and velocity for the depth of 3.6m.
a) 141.42 cumec
b) 151.42 cumec
c) 161.42 cumec

d) 171.42 cumec
(Ans:d)
25.A circular channel conveys 3.25 cumecs of water when ¾ of vertical diameter is immersed. The slope of the channel is 0.2m per kilometre. Determine the diameter of channel, using Manning's formula. Take C = 87.5.
a) D = 3
b) D = 1.9
c) D = 1
d) D = 3.9
(Ans:b

GATES

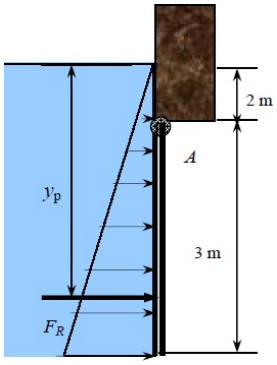
1. A long solid cylinder of radius 0.8 m hinged at point A is used as an automatic gate, as shown in figure of the free-body diagram of the fluid underneath the cylinder When the water level reaches 5 m, the gate opens by turning about the hinge at point A. Determine (a) the hydrostatic force acting on the cylinder and its line of action when the gate opens and (b) the weight of the cylinder per m length of the cylinder. (Ans. FR=52337 N , θ = 46.4°)

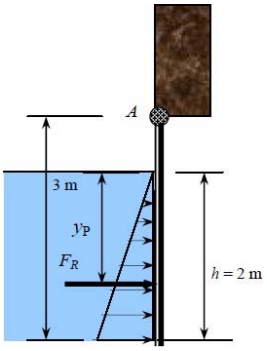


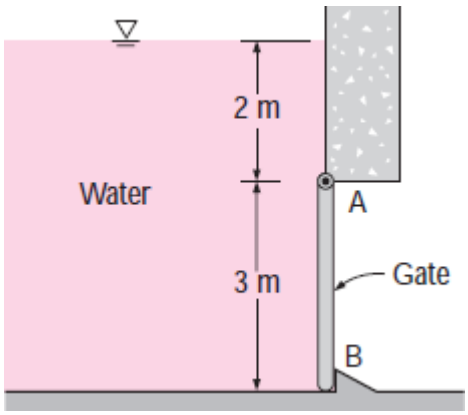


2. A 3-m-high, 6- d by a fixed ridge at B. Determine the ocation of the pressure center. eight of 2 m.

(Ans.(a) yP =3.71 m , (b) yP =1.33 m)







(a) (b)

3. _____A gate provided at the upstream end of the penstock.

a) . Navigation lock gates

b) Head race tunnel gates

c) Penstock gates / Intake gates

d) Surge shaft gates

(Ans.c)

4 . In a fixed roller of a spillway gate, the rollers are attached to the _____

a) gate

b) groove gate

c) either gate or groove gate

d) guide grooves

(Ans.a)

5. In the vertical Stoney spillway gate, the rollers are placed between the _____

a) gate and u/s groove guide

b) gate and the d/s groove guide

c) u/s and d/s groove guide

d) attached to the gate and groove guides

(Ans: b)

6. The spillway gate which when lowered cannot be seen from a distance is of the type

a) Sliding gate

b) Roller gate

c) Tainter gate

d) USBR drum gate

(Ans: d)

7. An ogee spillway of a concrete gravity dam having FRL of 328 m and MWL of 340 m is provided with vertical gates between piers erected on the spillway. The effective length of the spillway is 60 m. The discharge through the spillway when gates are opened up to the actual reservoir level of 331.0 m will be_____

a) 850 cumecs

b) 1700 cumecs

c) 2800 cumecs

d) 1000 cumecs

(Ans: b)

8. The most common vertical lift gates in modern days is _____

a) sliding gates

b) free-roller gates

c) stoney gates

d) fixed wheel gates

(Ans: d)

9. The working of Reinold's gate is automatic.

a) True

b) False

(Ans: a)

10. Which of the following gate is also called flush boards?

a) Dropping shutters

b) Tainter gates

c) Drum gates

d) Vertical lift gates

(Ans: a)

11. Projecting collars are provided on sides of a rectangular tunnel of length L made through an earthen dam to increase the seepage path. Their projection length (X) and numbers (N) are decided so as to provide increased seepage path equal to 2NX where 2NX should generally be _____

a) greater than L/4

b) greater than L/3

c) greater than L/2

d) greater than L

(Ans: a)

12. What is the value of head loss for the fully open gate and butterfly valves?

a) 0.5 V2 / 2g

b) V2 / 2g

c) 0.2 V2 / 2g

d) 0.04 V2 / 2g

(Ans: c)

13. Which one of the following gate is not suitable for curved crests?

a) Flush boards

b) Tainter gates

c) Drum gates

d) Vertical lift gates

(Ans: a)

14. Which of the following gate works on the principle of counterweights against the water pressure?

a) Dropping shutters

b) Stop logs and needles

c) Stoney roller gate

d) Drum gates

(Ans: a)

15. _____ are used only for very minor works.

a) Dropping gates

b) Stop logs and needles

c) Rectangular gates

d) Drum gates

(Ans: b)

16. Which of the following gate is not suitable for smaller spillways?

a) Drum gates

b) Radial gates

c) Needles and stop logs

d) Fixed roller gates

(Ans: a)

17. The dam was originally constructed in the 1930s with_____ designed to regulate flow with intended gate openings at about 10% of the water head above crest

a) spillway gates

b) Radial gates

c) Needles and stop logs

d) Fixed roller gates

(Ans: a)

18. _____ cylinder technology A controlled spillway in a dam has radial gates to regulate the water flow through the dam.

a) Stoney roller gate

b) fixed wheel gates

c) Radial gate

d) Sliding gate

(Ans: c)

19. Types of Spillway Gates?

a) Radial gate or tainter gates

b) Drum gates

c) Vertical lift gates or rectangle gates

d) all above

(Ans: d)

20. The skin plate of a radial gate and vertical lift gate is designed similar to a miter gate as an effective _____ for the ribs of the gate

a) flange width

b) hydrostatic head

c) rectangular plate

d) face of the gate

(Ans: a)

21. Designed especially for On-Farm canal and irrigation control, Check and Delivery gates, where the heaviest duty frame and actuator system is not required. guides, stainless hardware, and Neoprene seals are still standard. Typical cost of Stainless Steel fully automated gate is typically_____ than standard sluice.

a)50% great

b) 50% less

c)60%greater

d)60%less

(Ans: b)

22. _____ are hollow gate sections that float on water.

a) stoney gates

b) spillway gates

c) Drum gates

d) Vertical lift gates

(Ans: c)

23. The force on a rectangular flood gate can be calculated by the following equation

a) F = pA

b)F=ρ gh

c)F=s=d/t

d)F= qv*b

(Ans: a)

24. _____ a part of a cylindrical surface, which rests at the bottom of the channel and rises by rotating around its centre.

A

a) Needle sluice

b) Rising sector sluice gate

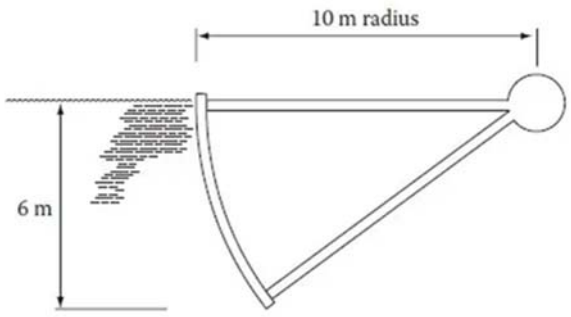
c) Fan gate

d) Flap sluice gate

(Ans: b)

25. A radial gate is to be used to control the flow down a spillway. The gate is 10 m in radius and 12 m wide, and is supported on two shaft bearings. Calculate the load on each bearing. Prove that the resultant hydrostatic force passes through the axis of the bearings.

(Ans. Fr =1778940N,load on each bearing = 889470N = 0.889MN)



SEEPAGE

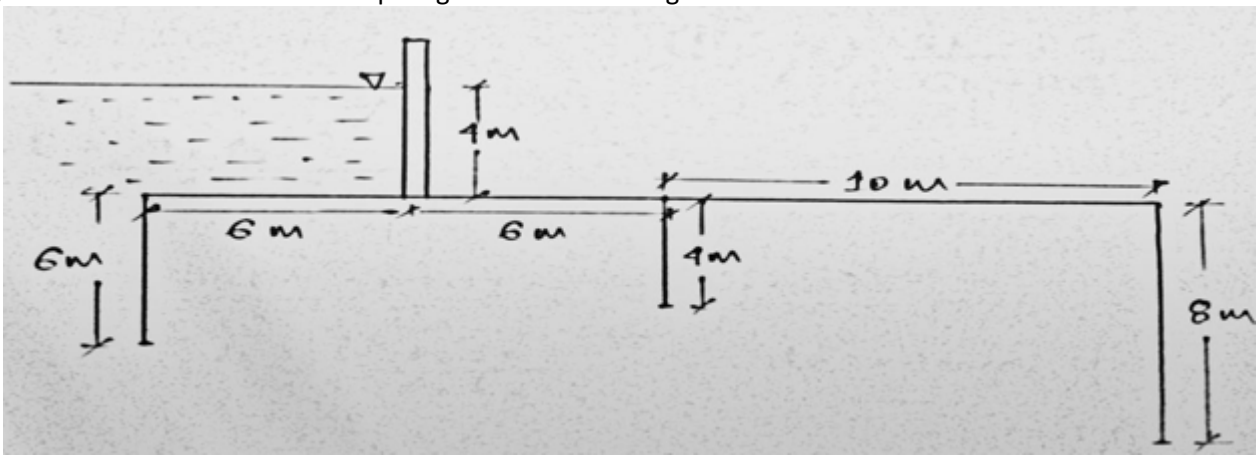
1) What are the two main causes of failure of hydraulic structure on the pervious foundation?
   a) Seepage and Over-turning
   b) Undermining and Uplift
   c) Over-turning and Piping
   d) Overturning and Uplift
2) The uplift pressure is not important for the upstream apron during considerations of failure due to uplift.
   a) True
   b) False
3) The structure finally subsides in the hollow formed in the foundation in which failure?
   a) Collapse
   b) Overturning
   c) Undermining
   d) Uplift

4) Heave piping may occur on the _____
   a) downstream of sheet pile or cut off wall
   b) upstream of sheet pile or cut off wall
   c) body of earth structure
   d) below the foundation
5) Backward erosion piping takes place when the phreatic line cuts the downstream face of the dam and seepage pressure is high.
   a) True
   b) False
6) The safety of a hydraulic structure founded on a pervious foundation can be ensured by:
   i. Provision sufficient length of its concrete floor.
   ii. Providing sufficient depth of its concrete floor.
   iii. Provision a downstream cutoff of some reasonable depth.
   a) i and ii
   b) i and iii
   c) i, ii and iii
   d) ii and iii
7) What is the value of Bligh's coefficient for coarse-grained soil?
   a) 15
   b) 12
   c) 5 to 9
   d) 8
8) For sand mixed with boulder and gravel and for loam soil, the safe hydraulic gradient should be _____
   a) 1/15
   b) 1/12
   c) 1/5 to 1/9
   d) 1/8
9) Which of the following is not a limitation of creep theory?
   a) No distinction between the vertical and horizontal creep
   b) No distinction between effectiveness of outer and inner faces of sheet pile
   c) Significance of exit gradient is not considered
   d) Only a nominal floor thickness is required on the upstream side so as to resist water
10) If the value of Bligh's coefficient for a particular soil is equal to 12 then, what is the safe hydraulic gradient for that soil?
   a) 1/12
   b) 1/9
   c) 1/15
   d) 1/5
11) According to Bligh, a vertical cut-off at U/s end of the floor is less useful than the one at the D/s end of the floor.
   a) True
   b) False
12) Consider the following statements about Bligh's Creep Theory.
   i. Creep length is the length of path traversed by percolating water
   ii. To increase the path of percolation vertical cut-off or sheet piles can be provided
   iii. Loss of head per unit creep length is hydraulic gradient
   iv. Bligh gave no criteria for the safety of weir against undermining
   Which of the following statements are correct?
   a) i, ii, iii
   b) ii, iii, iv

c) i, iii, iv
d) i, ii, iv

13) As per Bligh's theory, thickness to be provided by taking a factor of safety equal to _____
a) 2/3
b) 4/3
c) 1/3
d) 1/2

14) Calculate the value of creep length for the following.



a) 50 m
b) 26 m
c) 58 m
d) 36 m

15) The laplacian equation represents two sets of curves intersecting orthogonally.
a) False
b) True

16) What is the path represented by the streamlines?
a) Hydraulic Jump
b) Flow Net
c) Energy Dissipation
d) Water Flow

17) How many corrections are needed for the complex profile broken from simple forms, to be valid?
a) 1
b) 2
c) 3
d) 4

18) By how many considerations the depth downstream vertical cutoff is governed?
a) 2
b) 1
c) 3
d) 4

19) Khosla's theory of flow nets says that the loss head does not take place uniformly.
a) True
b) False

20) What is laplacian equation?
a) $d^2\phi / dx^2 + d^2\Phi/dz^2$
b) $d^2\Phi / dx^2 + d^2\Phi/dz^2$
c) $d\Phi / dx + d^2\Phi/dy^2$
d) $d^2\phi / dx^2 + d^2\Phi/dz$

21) What type of points is needed to be joined to form an equipotential line?
a) Equal Pressure Points
b) Residual Heads which still need Energy Dissipation
c) Velocity Gradient Points
d) Points of intersection of Streamlines and Velocity Components
22) The component of which force is to be counterbalanced so that the soil grains remain stable?
a) Upthrust Pressure Forces
b) Forces due to Velocity Components
c) Pressure Force
d) Seepage Water Force
23) What is the name of the gradient pressure at the exit end?
a) Gradient of Pressure
b) Exit Gradient
c) Streamline Gradient
d) Equipotential Gradient
24) Which method is evolved by khosla for designing of hydraulic structures?
a) Method of Gradients
b) Method of Variables
c) Method of Independent Variables
d) Method of Flow Nets
25) Seepage force is the energy transfer between _____
a) air and water
b) water and soil
c) air and soil
d) earth and air

Answers

1) b.
2) a
3) c
4) a
5) a
6) c
7) b
8) c
9) d
10) a
11) b
12) a
13) b
14) c
15) b
16) d
17) c
18) a
19) a
20) b
21) b
22) d
23) b
24) c
25) b

Rip-rap

1) Stone pitching or riprap is generally provided to avoid _____
   a) over-topping
   b) erosion of U/s and d/s face
   c) cracking due to frost action
   d) gully formation
2) Provision of sufficient freeboard eliminates _____
   i. Over-topping failure
   ii. Erosion of U/s face
   iii. Erosion of D/s face
   iv. Cracking due to frost action
   v. Gully formation
   Which of the following is/are correct?
   a) i and v
   b) ii and iii
   c) iv and v
   d) i and iv
3) The collection and removal of water before it acquires high downward velocities is ensured by provision of _____
   a) berms
   b) freeboard
   c) burrow pits
   d) spoil banks
4) In order to prevent the possibility of the cross-flow towards the earthen embankments, it is necessary to provide _____
   a) counter berms
   b) sides walls of sufficient height and length
   c) spoil banks
   d) sufficient freeboard
5) Sloughing is the process of _____
   a) progressive erosion
   b) subsequent removal of soil grains from within the dam
   c) uncontrolled seepage through the dam body
   d) progressive removal of soil from the D/s face
6) In foundation slide failure_____
   a) top of embankment gets cracked and lower slope moves outward forming large mud waves near the heel
   b) top of embankment gets cracked and lower slope moves inward forming large mud waves near the heel
   c) bottom of embankment gets cracked and lower slope moves outward forming large mud waves near the heel
   d) bottom of embankment gets cracked and lower slope moves inward forming large mud waves near the heel
7) What is the most critical condition of slide of the U/s slope?
   a) The sudden drawdown of the reservoir
   b) Reservoir full condition
   c) Steady seepage condition
   d) Sudden drawdown and reservoir full condition
8) When the reservoir is full, the slope which is most likely to slide is _____
   a) the upstream slope
   b) the downstream slope

c) both upstream and downstream slope
d) no effect

9) In order to keep the saturation line in a canal embankment well within the toe, it is necessary to provide _____
a) spoil bank
b) counter berm
c) freeboard
d) berm

10) Which of the following failures generally occur due to the development of unaccounted pore pressures?
a) Hydraulic failures
b) Piping through the dam body
c) Sliding in embankments
d) Sloughing of the d/s toe

Answers

1) b
2) d
3) a
4) b
5) d
6) a
7) a
8) b
9) b
10) c

_____

Water Hammer

1) Where is a water hammer developed?
a) Reservoir
b) Penstock
c) Turbine blades
d) Pipe line

2) Which among the following is true for hydroelectric power plants?
a) Operating cost is low and initial cost is high
b) Both operating and initial cost are high
c) Both operating and initial cost are low
d) Operating cost is high and initial cost is low

3) The power output of the turbine in a hydroelectric plant depends on_____
a) Type of dam and its system efficiency
b) Discharge and system efficiency
c) Type of turbine and type of dam
d) Type of turbine and area of the reservoir

4) Water hammer is developed in which power plant?
a) Solar
b) Nuclear
c) Hydro
d) Wind

5) Which among the following are commercial sources of energy?
a) Solar energy
b) Animal wastes
c) Agricultural wastes
d) Wood

6) Which is the most suitable place to build a hydroelectric power plant?
   a) Deserts
   b) Grasslands
   c) Hilly areas
   d) Underground
7) In a hydroelectric power plant, where is the penstock used?
   a) Between dam and the turbine
   b) Between turbine and discharge drain
   c) Turbine and heat exchanger
   d) Heat exchanger and fluid pump
8) Which among the following is used as a regulating reservoir?
   a) Reservoir
   b) Spillways
   c) Forebay
   d) Penstock
9) Gross head is defined as_____
   a) Difference of flow of object
   b) Difference of flow of air
   c) Difference of flow of water
   d) Difference of water level between the head race and tail race
10) What is the function of a surge tank?
   a) It causes water hammer
   b) Produces surge in the pipeline
   c) Relieves water hammer
   d) Supplies water at constant pressure
11) Hydro-graph is a graph that shows_____
   a) Load curve
   b) Energy curve
   c) Mass curve
   d) Volume curve
12) What is the function of a pump storage scheme?
   a) Improve power factor
   b) Improve mass factor
   c) Improve plant capacity factor
   d) Improve volume factor
13) What is the aim of pipe network analysis?
   a) To determine the mass of fluid
   b) To determine the volume of fluid
   c) To determine the flow rates and pressure drops
   d) To determine the cross sections of the pipe
14) The steady- state flow must satisfy _____
   a) Kirchhoff's law
   b) Newtons law
   c) Rutherford's experiment
   d) Kepler's law
15) What are the assumptions made for a fluid flow through a pipe?
   a) Fluid inertia is not taken
   b) Viscosity is not taken
   c) Volume is not considered
   d) Mass is not considere

Answers

1) b
2) a
3) b
4) c
5) a
6) c
7) a
8) c
9) d
10) c
11) a
12) c
13) c
14) a
15) a

ARCH DAM

1) Multiple Arch Dams Are Generally Used For _____
A) High Heights
B) Low Heights
C) Medium Heights

2) A Dam That Is Double-Curved In Both Its Horizontal And Vertical Planes May Be Called ?
A) A Dome Dam
B) Multiple-Arch Dams
C) Constant Angle Arch Dam

3). A Non-Vertical Arch Dam Is Known As A _____
A) Double Curvature Arch Dam
B) Shell Arch Dam
C) Both Double Curvature And Shell Arch Dams 11

4) Which Of The Following Is The Most Economical Type Of Arch Dam?
A) Constant Radius Type
B) Variable Radius Type
C) Constant Angle Type

5)A Constant Angle Arch Dam When Compared To Constant Radius Arch Dam Utilizes Concrete Quality Of About _____
A) 43%
B) 130%
C) 230%

6) Which Among The Following Type Of Dam Section Is Expected To Be The Thinnest And The Most Economical?
A) Constant Angle Arch Dam
B) Shell-Arch Dam
C) Constant Radius Arch Dam

7) In An Arch Dam, The Extrados Curve Refer To The Arch Rings Corresponding To The _____
A) The Upstream Face Of The Dam

B) Downstream Face Of The Dam
C) Side Face Of The Dam

8) A V-Shaped Valley With Stronger Foundations Can Suggest The Choice Of An Arch Dam Is Of The Type __
A) Constant Radius Arch Dam
B) Variable Radius Arch Dam
C) Constant Angle Arch Dam

9) A Constant Radius Arch Dam Is Also Sometimes Called As _____
A) Constant Centre Arch Dam
B) Constant Angle Arch Dam
C) Variable Angle Arch Dam

10) The Type Of Arch Dam Which Generally Requires Overhangs At Abutments Is Of _____
A) Constant Radius Type
B) Variable Radius Type
C) Constant Angle Type

11) The Best Design Of An Arch Dam Is When _____
A) All Horizontal Water Loads Are Transferred Horizontally To The Abutments
B) The Dam Is Safe Against Sliding At Various Levels
C) The Load Is Divided Between The Arches And Cantilevers And The Deflections At The Conjugal Points Being Equal

12) Which Of The Following Is Not The Basis For The Design Of An Arch Dam?
A) Thin Cylinder Theory
B) Trial Load Theory
C) Unit Column Theory

13) The Stresses Due To Rib-Shortening Become Quite Important In The Case Of _____
A) Long Thin Arch Dams
B) Thick Arch Dams Of Small Angle
C) Both Thin And Thick Arch Dams

14) The Temperature Stresses Producing Worst Effects In The Design Of Arch Dams Are Caused By _____
A) Rise In Temperature
B) Fall In Temperature
C) Both Rise And Fall

15) The Thin Cylinder Theory For Designing Arch Dams Is Based Only On _____
A) Temperature Stresses
B) Ice Pressures
C) Hydrostatic Water Pressure

16). Which Of The Following Theory Is The Most Accurate Method To Design Arch?
A) The Thin Cylinder Theory
B) The Theory Of Elastic Arches
C) The Trial Load Method

17). Which Of The Following Forces Is The Least Important In The Design Of Arch Dams?
A) Reservoir Water Force
B) Uplift Pressure
C) Temperature Stresses

18) An Arch Dam Looks Like A Single Arch In _____
A) Plan
B) Front Elevation
C) Side Elevation

19)The Most Economical Central Angle Of The Arch Rings Of An Arch Dam Can Be Adopted Only At One Place Preferably At Mid-Height In An Arch Dam Is Of The Type _____
A) Constant Angle Arch Dam
B) Constant Radius Arch Dam
C) Both Constant Angle And Constant Radius Arch Dam

20) According To Thin Cylinder Theory, The Volume Of Concrete Required For An Arch Dam Would Be Minimum If The Central Angle Is _____
A) 130° 34’
B) 133° 34’
C) 143° 34’

21) Type Of Dam Where The Forces Acting On The Dam Are Transmitted Onto The Abutment Rocks Is _____
A) Gravity Dam
B) Arch Dam
C) Geotechnical Dam

22) How Many Types Of Arch Dams Are Present?
A) 1
B) 3
C) 4
23) ------- Is Most Suitable For Narrow Canyons Or Gorges?
A) Arch Dam
B) Cofferdam
C) Embankment Dam

24) Arch Dams Classified With Respect To Their Structural Height Are?
A) Low Dams Up To 100 Feet (30 M),
B) Medium High Dams Between 100–300 Ft. (30–91 M)
C) All The Above

25) The Main Loads For Which An Arch Dam Is Designed Are?
A) Dead Load
B) Temperature Load
C) All The Above

ANSWER

1- a
2- a

3- c
4- c
5- a
6- b
7- a
8- c
9- a
10- c
11- c
12- c
13- b
14- b
15- c
16- c
17- b
18- a
19- b
20- b
21- b
22- b
23- a
24- c
25- c

BUTTRESS DAM

1) The load from the deck of a buttress dam is transmitted to the foundations through the _____
a) corbels
b) buttresses
c) lateral braces

2) Which of the following dam requires no reinforcement?
a) Fixed deck buttress dam
b) Cantilever deck buttress dam
c) Massive head buttress dam

3) Which of the following dam is also known as the Amber son dam?
a) Multiple arch buttress dam
b) Massive head buttress dam
c) Free deck buttress dam

4) Which of the following component of a buttress dam is also called counterfort?
a) Corbel
b) Buttress
c) Sloping deck

5) Which of the following component of a buttress dam is also called counterfort?
a) Corbel
b) Buttress
c) Lateral brace

6) Which of the following is the earliest recorded multiple arch buttress dam?
a) Meer Alam dam in India
b) The Coolidge dam in Arizona
c) Idduki dam in Kerela, India

7) The buttresses of a free deck buttress dam are provided at 'x' m clear spacing and buttress thickness is proposed to be't' m. The buttress section can then be designed like the section of a 8) concrete gravity dam by considering the effective unit weight of water = Surcharge factor (S) x actual unit weight of water. The value of this surcharge factor is given as _____
a) S = (x + t)/x
b) S = (x + t)/t
c) S = (x + t)/(x + 1)

8) One of the disadvantages of the buttress dams?
a) It requires constant maintenance and supervision.
b) Life of the dam is more as compared to other dams.
c) Buttress dam requires less for work than solid concrete dams.

9) What is the suggested economic buttress spacing for a mean dam height of greater than 45 m?
a) 4.5
b) 4.5 to 7.5
c) 12 to 15

10) A Buttress dam or hallow dam is with?
a)A weak, water- tight upstream side
b)A solid , water- tight upstream side
c)A light , water- tight upstream side

11)The dam wall may be?
a) Tortuous
b) Circular
c) Straight

12) The other consideration to selection of type of buttress dam is?
a) Concrete
b) Materials
c) Economy

13) Which of the following buttress dams have rigidity of construction?
a) Deck slab buttress dams
b) Rigid buttress dams
c) Bulk head buttress dams

14) The Essential components of buttress dam?
a) Deck
b) Wall
c) Deck & Buttress

15) The buttress can be constructed on the?
a)Strong foundation
b) Weak foundation

c)Critical foundation

16) 11. What is the suggested slenderness ratio for simply supported RCC decks?
a) 4.5 to 7.5
b) 7.5 to 12
c) 12 to 15

17) The buttresses spacing, depending on the height of dam varies from?
a)7 to 18m
b)5 to 15m
c)5 to 18m

18)The upstream slope in the deck slab buttress dams of the slap may vary between?
a)35 0 to 45 0 with the horizontal
b)37 0 to 45 0 with the horizontal
c)36 0 to 45 0 with the horizontal

19) Which type of dam is suitable for wide valley with poor foundation?
a) Deck slab buttress dam cantilever
b) Deck slab buttress dam simple deck
c) Gravity dam

20) The types of buttress dams is?
a) Deck slab buttress dam
b) Multiple dome buttress dam.
c) All the above

21) Which is the special type of buttress dams?
a) The massive-head dam
b) Multiple dome buttress dam.
c) Deck slab buttress dam
22) ---------- is the most prominent modern variant of the type of buttress dams?
a) The solid head
b) Massive head
c) All the above

23)At the upstream end, a cut-off is provided to?
a) Prevent or reduce the seepage of water
b) Prevent or reduce the hydraulic jump
c) Prevent or reduce the overflow

24)One of the type of the deck slab buttress dam?
a)Fixed deck slab
b) Cantilever slab
c)All the above

26) 12. What is suggested massiveness factor for simply supported RCC Decks?
a) 2.5 to 3
b) 3 to 4.5
c) 4.5 to 7.5

ANSWERS

1- b
2- c
3- c
4- b
5- c
6- a
7- b
8- a
9- c
10- b
11- c
12- c
13- b
14- c
15- b
16- c
17- a
18- b
19- c
20- a
21- b
22- a
23- c
24- a
25- a

SYPHON

1.The definition of siphon is the structure of the constructed at the
A. Instruction of two Waterways.
B. At the beside of two water Way
C. at the long of to Waterways

2. The design procedure is similar to the
A. Dam design procedure.
B. Calverts design procedure.
C. weir design procedure.
3... one of the types syphon aqueduct is
A. canal passing over the natural drain
B. canal passing below the natural drain
Canal passing through in natural drain

4. one of the type syphon aqueducts is
A ...both side of canal are completely made with concrete or mosenry if length of drainage
B… if length of drainage is small
C… if length of drainage is medium

5. Inlets and Outlets are are inferior to acueduct or super passage type of WORK

A. true
B. false

6. In case of the siyphon The(Fsl)(flow stream level) is match above the bed level of the drainage through so that the canal runs the syphonic action
A. true b...false

7. A syphon aqueduct the worst condition of the uplifting the floor orcas when:
A… the canal is full and the drainage empty with the water table at the drainage bed
B…. the canal and the drainage empty with the water table at the drainage bed
C…. The canal is empty and the drainage full with water table of the drainage bed
D…. the canal is full and and the drainage empty would the water table below the floor

8. The floor of the syphon aqueduct needs to be designed for the condition when
1. The canal is full on the drainage is discharge
2. The Canal and the drainage are flowing full
3.the Canal is empty and the drainage is discharge is full
A….1 ..ONLY
B... 2 ..only
C.1.. and… 2
D...2.. and.. 3..

9. Which of the following cross draine works carry drainage over the canal
A. aqueduct and syphon aqueduct
B. super passage and syphon
C. level- crossing and inlets outlets
D. canal syphon on and aqueduct

10. The canal water flows freely under gravity in which of the following Cross drain works
A. aqueduct and super passage
B. super passage and syphon
C. canal syphon and aqueduct
D. level- crossing and inlets outlet

11. Super passage is the Various of.
A. syphon
B. aqueduct
C. inlets and outlets
D. syphon aqueduct

12. Which is the following sustainment is not correct about canal syphon?
A. Free service level canal is match above then the bed level of the drainage through
B. to minimize the trouble of silting a ramp is provided at the exit
C. the canal water flows under .the syphonic action
D. For syphonic small discharge barrels are adopted

13. The syphon installed with a gravity dam to spILL the surplus reservoir water as known as
A. hooded type syphon spillway
B. titled Outlet type syphon spilway
C. both hooded and titled type syphon spillway
D. shaft spillway

14. the syphon installed overflow dams constitute what over known as
A. Hooded type syphon spillway
B. Tilted outlet type syphon spillway
C. baby syphon

15. the crest of syphon spillway is fixed at
A. full reseruir level
B.dead storage level
C. maximum water level
D. top of the dam

16. siphon spillway is sufficiently independent of the water surface elevation of the reservoir
A. true b. false

17. For a saddle siphon, the maximum operative head is 4.53 m. The width and height of the throat of the siphon are 5 m and 2.25 m respectively. The coefficient of discharge is 0.90. How many units are required to pass a flood of 350 cumecs? (Assume g = 10 m/s^2)
a) One
b) Two
c) Three
d) Four

18. A siphon spillway in a concrete gravity dam is in the shape of _____
a) U-shape
b) Inverted U-shape
c) Horizontal bend through the abutment
d) Any straight line

19. The canal alignment is finalized only after finalizing the CD works.
a) True
b) False

20. Inlets and Outlets are inferior to aqueduct or super-passage type of work.
a) True
b) False

Answer of question

Q1 : a	Q2.. :b
Q3…: a	Q4....a
Q5…: a	Q6.. …a
Q6… …c	Q7.. …d
Q8……d	Q9 …b
Q10 …a	Q11 ….b
Q12…d	Q13 …b
Q14 …a	Q15…a
Q16…..a	Q18…. b

Q17. Answer: d
Solution :
Q = C_d. A. $(2gH)^{1/2}$ Where C_d = 0.9, H = 4.53 m and A = 5 x 2.25 = 11.25 m^2
Q = 0.9 x 11.25 x $(2 \times 9.81 \times 4.53)^{1/2}$ = 95.45 m^3/sec
No. of units of saddle siphon = 350 / 95.45 = 3.66 units. = 4 units.

Q19…a	Q20..a

AQUEDUCT

1. A structure that carries water above land is known as an _____
a) aqueduct
b) aqueduct
c) over surface
d) outland
2. Water carriage is the conducting or conveyance of water from place to place.
a) True
b) False
3. What is an artificial channel for conveying water, typically in the form of a bridge across a valley or other gap called?
a) Aquifer
b) Canals
c) Aqueduct
d) Tunnel
4. Aqueduct is an example of _____ channel.
a) Natural
b) Prismatic
c) Non prismatic
d) Artificial
5. In foundation slide failure_____
a) top of embankment gets cracked and lower slope moves outward forming large mud waves near the heel
b) top of embankment gets cracked and lower slope moves inward forming large mud waves near the heel
c) bottom of embankment gets cracked and lower slope moves outward forming large mud waves near the heel
d) bottom of embankment gets cracked and lower slope moves inward forming large mud waves near the heel

6.The provision of drainage gallery in a gravity dam helps in reducing _____
a) hydrostatic pressure
b) seepage pressure
c) silt pressure
d) both hydrostatic pressure and seepage pressure
7. Which of the following attempts are made to reduce the uplift in order to economize on the provided section of a concrete gravity dam?
1- Providing drainage gallery to collect seepage water
2- Constructing cut-off under upstream face
3- Pressure grouting in dam foundation
4- Provision of shear keys or keyways
a) 1and 2
b) 1,2 and 3
c) 1,2 and 4
d) 1,2.,3 and 4
8. During seepage through an earthen mass, the direction of seepage is _____ to the equipotential lines.
a) perpendicular
b) parallel

c) not defined
d) diagonal
9. In gravity weir, the uplift pressure is due to the seepage of water.
a) True
b) False
10. The berms help in checking excessive loss of water due to seepage.
a) True
b) False
Answer of equation

Q1. Answer: a
Q2. Answer : a
Q3.. Answer: a
Q4..Answer: c
Q5... Answer: a
Q6...Answer :b
Q7...Answer :b
Q8...Answer: a
Q9... Answer: a
Q10...Answer: a

SEEPAGE

1.The component of which force is to be counterbalanced so that the soil grains remain stable?
a) Upthrust Pressure Forces
b) Forces due to Velocity Components
c) Pressure Force
d) Seepage Water Force.
2. What type of irrigation scheme uses pick-up weir?
a) Combined System
b) Storage Irrigation
c) Direct Irrigation
d) Perennial Irrigation
3. Inlets and Outlets are inferior to aqueduct or super-passage type of work.
a) True
b) False
4. On what factor in case of branch canals, the construction site for a fall depends?
a) Cost of Excavation
b) Topography
c) Commanded Area
d) Cost of fall
5. A flow net can be used for which of the following purpose?
a) Determination of seepage
b) Determination of seepage pressure
c) Determination of hydrostatic pressure
d) All of the mentioned
6. What are the structures that are constructed at suitable intervals along the sewerage system called?
a) Manholes
b) Catch basins
c) Pumps
d) Sewer appurtenances

7. A siphon aqueduct is constructed at a canal crossing site where drainage HFL was 212.2 m by allowing an afflux of 0.4 m at high flood discharge. At this site, the water level downstream of the crossing at the same high flood will be _____
a) 212.2 m

b) 212.6 m
c) 211.8 m
d) It cannot be predict
8. The most appropriate and economical CD work at the above site will be:
a) An aqueduct
b) A super-passage
c) A siphon aqueduct
d) A siphon
9.cut off and control of under seepage

1- Open trench cut –off
2- Grouted cut off
3- Upstream blanket .

A-true b-false

10 . A shaft spillway is located _____
a) inside the body of a gravity dam
b) inside the upstream reservoir
c) inside the downstream reservoir
d) on the side flanks of the main dam

11. The only spillway among the following through which the discharge does not increase as fast as it increases in all others is _____
a) chute spillway
b) side-channel spillway
c) ogee spillway
d) shaft spillway

12. Which of the following spillway is designed in India by Ganesh Iyer?
a) Saddle siphon spillway
b) Saddle spillway
c) Glory hole spillway
d) Volute Siphon spillway
13. The crest of a siphon spillway is fixed at _____
a) full reservoir level
b) dead storage level
c) maximum water level
d) top of the dam
14. the structure which is not used in a shaft spillway is _____
a) tunnel
b) bridge
c) radial gates
d) radial piers
15. An un gated spillway starts functioning as soon as the water level in the reservoir crosses the _____
a) maximum reservoir level
b) minimum reservoir level
c) maximum conservation level
d) full Supply level
16. Which of the following is the simplest type of spillway and may be constructed on small bunds or thin arch dams?
a) Straight drop spillway

b) Ogee spillway
c) Shaft spillway
d) Siphon spillway
17. The spillway can be best built independently of the dam when there is _____
a) deep narrow gorge with steep slopes
b) deep narrow gorge with gradual slopes
c) wide gorge with a gradual slope
d) wide valley with moderate slopes

18. Which of the following is a secondary safety arrangement?
a) Safety valves
b) Spillway gates
c) Subsidiary spillway
d) Energy dissipaters

19. In a fixed roller of a spillway gate, the rollers are attached to the _____
a) gate
b) groove gate
c) either gate or groove gate
d) guide grooves

20 .The spillway gate which when lowered cannot be seen from a distance is of the type ___
a) Sliding gate
b) Roller gate
c) Tainter gate
d) USBR drum gate

Answer of equation

Q1….d Q2. …d
Q3…. a Q4…. C
Q5..d Q6…. d
Q8..d Q9..a
Q10…b Q11..d
Q12…d Q13..a
Q14…c Q15…c
Q16…a Q17…a
Q18..c Q19…a
Q20….d

Q7… a
Solution :
The D/s HFL of the drain remains the same by the construction of works and the U/s HFL can be obtained by adding afflux to the D/s HFL.
The D/s water level = 212.2 m
The U/s water level = 212.2 + 0.4 = 212.6 m.

DESIGN EARTH DAMS

1-Which of the following earth dam is suitable only on impervious foundation?
a) Zoned embankment type

b) Homogenous embankment type
c) Non-homogenous type
d) Diaphragm type
2-Which of the following zone in Zoned type embankment prevents piping through cracks?
a) Central core
b) Transition zone
c) Outer zone
d) Core wall
3-Which of the following soil material is most preferred for the central core material of zoned embankment type dam?
a) Highly impervious clay
b) Sands or silty clays
c) Coarse sands
d) Gravels
4-Which embankment has the thickness of the diaphragm at an elevation less than 10 meters or the height of the embankment above the corresponding elevation?
a) Diaphragm type dam
b) Zoned type dam
c) Non-homogenous earth dam
d) Homogenous earth dam
5- The blanket in earth dam is provided_____
a) at the ground level on u/s side
b) at the ground level on the d/s side
c) at the ground level of the D/s side of the dam
d) on the D/s slope
6-Which of the following statement is correct with reference to earthen dams?
a) These dams are very costly as compared to other types
b) Gravity dams are less susceptible to failure as compared to rigid dams
c) These dams are suitable for construction on almost every type of foundation
d) Highly skilled labor is generally not required
7-During the construction of an earthen dam by hydraulic fill method, development of pore pressure becomes important in the _____
a) central impervious core
b) pervious outer shell
c) transition zone
d) both central core and outer shell
8-The process of laying and compacting earth in layers by power rollers under OMC for construction of earthen dams is known as _____
a) Rolled fill method
b) Hydraulic fill method
c) OMC method
d) Compaction
9-The central core of the zoned embankment type earth dam _____
a) checks the seepage
b) prevents piping
c) gives stability to the central impervious fill
d) distribute the load over a large area
10-Which type of dam is suitable on shallow pervious foundations?
a) Zoned embankment type
b) Homogenous embankment type
c) Both Non-homogenous type and homogenous type

d) Diaphragm type
11-What is the U.S.B.R recommended value for freeboard when the height of the dam is more than 60 m?
a) 2 m to 3 m
b) 2.5 m above the top of gates
c) 3 m above the top of gates
d) More than 3 m
12-What is the recommended formula for top width of a very low dam?
a) H + 3
b) 0.2H + 3
c) 0.2 H
d) H + 5
13-What is the Terzaghi's recommended value of U/s side slope for earth dam of height less than 15m of homogenous silty clay?
a) 2: 1
b) 2.5: 1
c) 3: 1
d) 3.5: 1
14-If the height of the dam is 10 m, then the value of top width (A) according to Strange's recommendations is_____
a) 1.85 m
b) 2.5 m
c) 3.0 m
d) 4.0 m
15- When the height of the dam is in between 7.5 to 15, the Strange's recommended value for maximum freeboard of low earth dams is _____
a) 1.2 to 1.5
b) 1.5 to 1.8
c) 1.85
d) 2.1
16- Calculate the top width (A) of the earth dam of height 50 m.
a) 5.0 m
b) 4.75 m
c) 6.10 m
d) 3 m
17- Aphreatic line in seepage analysis is defined as the line on which pressure is
a) equal to the atmosphere
b) greater than atmosphere
c) lower than atmosphere
d) varying
18- Provision of horizontal berms at suitable vertical intervals may be provided in the downstream face of an earthen dam in order to_____
a) allow the movement of cattle
b) allow the inspection of vehicles to move
c) reduce the erosion caused by the flowing rainwater
d) increase the erosion
19- During seepage through an earthen mass, the direction of seepage is _____ to the equipotential lines.
a) perpendicular
b) parallel
c) not defined
d) diagonal

20- The upstream face of the earth dam is considered as_____
a) equipotential line
b) streamline
c) streak line
d) path line
21- Which of the following line acts as a dividing line between dry (or moist) and submerged line?
a) Equipotential line
b) Path line
c) Seepage line
d) Streak line
22- Which of the following earth dam is suitable only on impervious foundation?
a) Zoned embankment type
b) Homogenous embankment type
c) Non-homogenous type
d) Diaphragm type
23- Which of the following soil material is most preferred for the central core material of zoned embankment type dam?
a) Highly impervious clay
b) Sands or silty clays
c) Coarse sands
d) Gravels
24- Which of the following statement is correct with reference to earthen dams?
a) These dams are very costly as compared to other types
b) Gravity dams are less susceptible to failure as compared to rigid dams
c) These dams are suitable for construction on almost every type of foundation
d) Highly skilled labor is generally not required
25- The effects of capillary fringe are on the slightly safer side and are neglected?
a) True
b) False

Answer of questions

1 b	6 c	11 c	16 c	21 c
2 b	7 a	12 b	17 a	22 b
3 b	8 a	13 b	18 c	23 b
4 a	9 a	14 b	19 a	24 c
5 a	10 a	15 c	20 a	25 a

Design floors for hydraulic installations

1- Heavy lifting work is often accomplished by shifting fluids in big machines. The power system of such machines can be described as
a) Reciprocating
b) Pneumatic
c) Hydraulic
d) Hybrid
2- The scientific principle that makes hydraulic systems possible is
a) Pascal's principle
b) Boyle's law
c) Bernoulli's principle
d) The fluid flow principle

3- Pneumatic and other power systems can support three kinds of motion; they are
a) Linear, reciprocating, and random motion
b) Linear, flowing, and rotary motion
c) Linear, zigzag, and spiral motion
d) Linear, reciprocating, and rotary motion
4- A single acting cylinder can be pressurized externally from one direction only.
a) True
b) False
5- A one-way valve that lets air into the reservoir of a compressor, but doesn't let it out, is a
a) Check valve
b) Receiver valve
c) Control valve
d) Three-way valve
6- Series circuits work on both hydraulic and pneumatic actuators
a) True
b) False
7- 5/2 way single solenoid valve has
a) 2 ports 2 positions
b) 5 ports 2 positions
c) 5 ports 5 positions
d) 2 ports 5 positions
8- The _____ converts the compressed air energy into mechanical energy in the form of linear movement in one direction only.
a) Piston cylinders
b) Double acting cylinders
c) Single acting cylinders
d) Hydraulic pumps
9- A _____ restricts air flow.
a) Throttle valve
b) Shuttle valve
c) Directional control valve
d) Single acting cylinder
10- When the piston area of the cylinder is connected to the atmosphere, the piston of the single-acting cylinder is pressed by the spring to the _____
a) Cylinder center
b) Cylinder down
c) Cylinder bottom
d) Cylinder upper
11- A structure that allows water to flow under a road, railroad, trail, or similar obstruction from one side to _____ the other side is called as
a) drainage
b) bridges
c) tunnel
d) culverts
12- A structure that carries water above land is known as an
a) aqueduct
b) aquedant
c) over surface
d) outland
13- If the span of crossing is greater than 12 feet (3.7 m), the structure is termed as bridge and otherwise is culvert .

a) True
b) False
14- Culverts cannot be constructed of a variety of materials including cast-in-place or precast concrete.
a) True
b) False
15- Construction or installation at a culvert site generally results in disturbance of the site soil.
a) True
b) False
16- Box culverts can be defined as a passage for water over a natural ground having a deck slab over it as path way for vehicles.
a) True
b) False
17- A culvert can be used to span over a canyon, or depression, or even over a freeway or roadway.
a) True
b) False
18- The process of removing culverts, which is becoming increasingly prevalent, is known as
a) out lighting
b) culverting
c) daylighting
d) inlighting
19- An _____ culvert is normally a low profile culvert. It allows them to be installed without disturbing the causeway as it will span over the entire drainage width.
a) box
b) rectangle
c) arch
d) circular
20- _____ culverts have a concrete (sometimes other materials can be used too) floor allowing the water to flow smoothly through it.
a) Box
b) Cylindrical
c) Narrow
d) Long
21- The uplift pressure is not important for the upstream apron during considerations of failure due to uplift.
a) True
b) False
22- The structure finally subsides in the hollow formed in the foundation in which failure?
a) Collapse
b) Overturning
c) Undermining
d) Uplift
23-Heave piping may occur on the_____
a) downstream of sheet pile or cut off wall
b) upstream of sheet pile or cut off wall
c) body of earth structure
d) below the foundation
24- Backward erosion piping takes place when the phreatic line cuts the downstream face of the dam and seepage pressure is high.
a) True
b) False

25- The safety of a hydraulic structure founded on a pervious foundation can be ensured by: i. Provision sufficient length of its concrete floor. ii. Providing sufficient depth of its concrete floor. iii. Provision a downstream cutoff of some reasonable depth.

a) i and ii
b) i and iii
c) i, ii and iii
d) ii and iii

Answer of questions

1 c	6 a	11 a	16 b	21 a
2 a	7 b	12 a	17 c	22 c
3 d	8 c	13 b	18 c	23 a
4 a	9 a	14 a	19 a	24 a
5 a	10 a	15 b	20 b	25 c