Water Resources Engineering II

(Practice Questions)

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Gravity Dam

1. When the reservoir is empty, the single force acting on it is the self-weight of the dam which acts at a distance of _____

a) B/2 from the heel
b) B/6 from the heel
c) B/3 from the heel
d) B/4 from the heel

2. The factor of safety against overturning generally varies between _____

a) 2 to 3
b) 1.5 to 2
c) 0.5 to 1.5
d) 1 to 2

3. What is the maximum permissible tensile stress for high concrete gravity dam under worst conditions?

a) 500 KN/m2
b) 500 kg/cm2
c) 5 kg/m2
d) 50 KN/m2

4. When the upstream face of a gravity dam is vertical, then the intensity of water pressure will act at?

a) 4H/3π
b) H/2
c) H/3
d) 3H/4π

5. Which failure occurs when the minimum stress exceeds the allowable compressive stress of the dam material?

a) Overturning
b) Crushing
c) Sliding
d) By development of tension

6. A low gravity dam of elementary profile made up of concrete of relative density 2.57 and safe allowable stress of foundation material 4.2 MPa. What is the maximum height of the dam without considering the uplift force?

a) 120 m

b) 217 m
c) 279 m
d) 325 m

7. The Uplift pressure on the face of a drainage gallery in a dam is taken as :

a) Hydrostatic pressure at toe
b) Average of hydrostatic pressure at toe and heel
c) two-third of hydrostatic pressure at toe plus one-third of hydrostatic pressure at heel
d) Equal to hydrostatic pressure at heel

8. The vertical stress at the toe was found to be 3.44 MPa at the base of the gravity dam section. If the downstream face of the dam has a slope of 0.617 horizontal: 1 vertical, the maximum principal stress at the toe of the dam when there is no tailwater is _____

a) 1.7 MPa
b) 2.4 MPa
c) 3.6 MPa
d) 4.8 MPa

9. The axis of a gravity dam is the _____
a) line of the crown of the dam on the downstream side
b) line of the crown of the dam on the upstream side
c) centre-line of the top width of the dam
d) line joining mid-points of the base

10. Horizontal acceleration due to earthquake results in:

a) Hydrodynamic pressure
b) Inertia force into the body of the dam
c) Wind Pressure
d) Hydrodynamic Pressure & Inertia force into the body of dam

11. Transverse joints in concrete gravity dams are the _____
a) horizontal construction joints at each lift height
b) vertical construction joints of full height and width
c) diagonal construction joints for torsion
d) longitudinal construction joints of full width

12. The Vertical component of the earthquake wave , which produce adverse effects on the stability of a dam, is, when it is acting in;

a) upward direction
b) Downward direction
c) Inclined direction
d) Horizontal direction

13. In a concrete gravity dam with a vertical upstream face, the stabilizing force is provided by the:

a) Weight of the dam
b) The water supported against the upstream slope
c) Uplift pressure
d) Wind Pressure

14. Development of tensile stresses in a concrete or masonry gravity dam are usually not allowed, because it may lead to development of tension cracks, ultimately causing failure of the structure, by

a) Excessive seepage
b) Excessive tensile stresses
c) Excessive compressive stresses
d) Excessive erosive stresses

15. The general value of lift for concrete is taken as _____
a) 1.5 m
b) 2.5 m
c) 3 m
d) 4 m

16. For usual values of permissible compressive stress and specific gravity of concrete, a high concrete gravity dam is the one, whose height exceeds

a) 48m
b) 70m
c) 88m
d) 50m

Earthen Dam

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. Point out the correct statement with reference to Earthen Dams:
a) These dams are very costly as compared to other types
b) They are less susceptible to failure as compared to rigid dams
c) They can be constructed almost on every type of foundation
d) Highly skilled labour is generally not required

3. 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

4. The most preferred soil for the central impervious core of a zoned embankment type of an earthen dam, is:

A) Highly impervious clay
b) Highly pervious gravel
c) Coarse sand
d) Clay mixed with fine sand

5. 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

6. The most preferred type of an earthen dam section is the one, in which the

a) Entire embankment is made of one type of soil
b) Inner embankment is made of highly porous soil, surrounded by the outer shell of highly impervious soil, both separated by transition filter material of mediocre permeability
c) Inner embankment is made of highly impervious soil surrounded by the outer shell of highly pervious soil, both separated by transition filter of mediocre permeability
d) None of the above

7. Pure Clayey soils are generally not preferred for the central impervious cores of a zoned type of earthen dams, because

a) Clays are highly impervious
b) Clays are highly pervious
c) Clays are susceptible to cracking
d) Clays are susceptible to tensile failure

8. Calculate the top width (A) of the earth dam of height 50 m.
a) 5.0 m
b) 4.75 m
c) 6.13 m
d) 3 m

9. Co-ordination between field and design engineers to ensure continuous field observations and modifications in design during construction, is more importantly required in case of :

a) Concrete gravity dams
b) Masonry gravity dams
c) Arch Dams
d) Earthen Dams

10. 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

11. During the maintenance of an earthen dam, the apparent seepage through the foundation of the dam is best taken care of, by providing:

a) A Chimney drain
b) A rock toe
c) A drain trench along the downstream toe
d) An upstream impervious cutoff

12. 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

13. On moderate foundations, and particularly in seismic areas, the type of dam which can preferably be considered for construction, is:

a) Masonry gravity dam
b) Earthen dam
c) Rock fill dam
d) Arch dam

14. A rock toe and a horizontal filter is provided on the downstream base of an earthen dam in order to _____
a) prevent piping action in the dam body
b) prevent piping action in the dam foundation
c) reduce the seepage quantity by blocking its flow
d) collect and drain out the seepage flow

15. The base width of a rock-fill dam in comparison to that of an earthen dam is _____

a) much larger
b) much smaller
c) sometimes large sometimes smaller
d) almost equal

Spillways and Flood Control Works

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

2. 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

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. 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

5. If the head of the water over the spillway is less 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 discharge coefficient of the spillway is increased
d) the discharge coefficient of the spillway will be reduced

6. 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) Is taken approximately
d) Cannot be measured

7. The side slope of approach channel of chute spillway is _____

a) 1:1

b) 1:1 12

c) 1:3

d) 1:2.5

8. The portion of the chute spillway, which is known as its control structure, is:

a) Low Ogee weir

b) Chute channel

c) Approach channel leading the water from reservoir to the Ogee weir

d) Stilling basin at its bottom

9. A shaft spillway is located

a) Inside the body of gravity dam

b) Inside the upstream reservoir

c) Inside the downstream reservoir

d) On side flanks of the main dam

10. 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

11. The most ideal condition for energy dissipation in the design of spillways is the one, when

a) The tail water rating curve lies above the jump rating curve at all discharges

b) The tail water rating curve coincides with the jump rating curve at all discharges

c) The tail water rating curve lies below the jump rating curve at all discharges

d) The tail water rating curve lies above or below the jump rating curve, depending upon the discharge.

12. A sloping apron is provided partly above the river bed and partly below the river bed in case of _____

a) when TWC coincides with the JHC at all discharges

b) when TWC lies above the JHC at all discharges

c) when TWC lies below the JHC at all discharges

d) when TWC lies above the JHC at low discharges and below the JHC at high discharges

13. 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

14. 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

15. Calculate the freeboard for the top levels of the side walls if the mean velocity of water in the chute reach is 3.5 m/s and the mean depth of water in the chute reach under consideration is 4.7 m.

a) 0.60 m

b) 1 m

c) 0.85 m

d) 0.55 m

Irrigation Channels (Silt theories)

1. The anit-dunes develop on beds of alluvial streams, when Froude number is:

a) 0

b) 0.5

c) 1

d) 1.2

2. The force exerted by the flowing water on the sediment particles to cause their motion, is called:

a) Buoyant force

b) Tractive force

c) Kinematic force

d) Eddy force

3. Manning's rugosity coefficient is proportional to:

(where d is representative grain dia of bed surface)

a) $\sqrt{d}$

b) d

c) $d^{1/6}$

d) $d^{2/3}$

4. The Garrets diagrams are based on:

a) Lacey's theory
b) Khosla's theory
c) Bligh's theory
d) Kennedy's theory

5. Lacey's regime theory is not applicable to a canal in:

a) True regime
b) Initial regime
c) Final regime
d) False regime

6. Which of the following statement is not correct about sediment load phenomenon and its measurement?
a) The material is kept in suspension by the turbulence or by the generation of eddies
b) In laminar flow, the shear stress is caused due to the difference of the velocities at the top and the bottom
c) In turbulent flow, momentum transfer is not very significant
d) Due to the formation of eddies, the sediment transfer from high concentration regions to the low concentration regions takes place

7. What is the effect of scouring in channels?
a) The Channel Section gets reduced
b) Reduces Discharge Capacity
c) Improper Working of Channel
d) Breaching of Canal Banks

8. Stable channels for a given bed-load transport, can be best designed on the basis of:

a) Lacey's Theory
b) Kennedy's Theory
c) Einstein's Theory
d) Von-Korman's Theory

9. Two Irrigation Channels, A and B, are designed on Lacey's theory to carry the same discharge. The alluvial through which canal A has to pass, however is coarser than that for canal B. In such design, we expect:

a) Channel A to be deeper
b) Channel B to be deeper
c) Channel A to have larger wetted perimeter
d) Channel B to have larger cross-sectional area

10. The Critical velocity ratio was introduced in Kennedy's equation of critical velocity to take into account the effect of:

a) Channel cross-section
b) Climatic condition
c) Silt Grade
d) Roughness of bed

Canal Head works and Distribution System

1. Lining of irrigation channels

a) Increases water logging
b) Increases channel cross-section
c) Increases command area
d) Increases chances of breaching

2. The main advantage offered by Bentonite layer lining in an irrigation channel is that

a) Seepage loss is reduced
b) Cross-sectional area of the channel is reduced
c) Cost of land acquired is reduced
d) Earthwork excavation is reduced

3. What factor creates temporary and continuous waterlogging?
a) Submergence due to Floods
b) Flat Topography
c) Impervious Obstruction
d) Excessive Rains

4. Canal irrigation is generally preferred in _____
a) alluvial canal
b) non-alluvial canal
c) non-perennial canal
d) feeder canal

5. Which canal is not provided with any headworks for diversion of river water?
a) Permanent canal
b) Feeder canal
c) Perennial canals
d) Inundation canals

6. On flatlands what type of canal alignment is used?
a) Side Slope Canal

b) Contour Canal
c) Watershed Canal
d) Field Channel

7. Which type of canal is the farmer's responsibility?
a) Contour Canal
b) Side Slope Canal
c) Watershed Canal
d) Field Channel

8. Loss of canal discharge occurs mainly due to?
a) Seepage and Percolation
b) Percolation and Absorption
c) Seepage and Evaporation
d) Seepage and Absorption

9. 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

10. Which of the following statement is wrong?
a) A lined canal is not susceptible to erosion
b) The provision of adequate lining reduces the danger of breaches of channel
c) The lining does not reduce the money spent in removing weeds
d) Lining eliminates flood dangers

11. Due to inadequate drainage which factor causes waterlogging with constant percolation?
a) Over and Intensive Irrigation
b) Impervious Obstruction
c) Inadequate Surface Drainage
d) Flat Topography

12. Which of the following is not a cause for the hydrostatic pressure on the lining?
a) Seeping of the rainwater in the backfill
b) When the water table remains below the canal bed
c) The backfill is of low drainage
d) The backfill is of high permeability (i.e. > 3 cm/sec)

13. Which one of the following is not a remedial measure for water logging?
a) Good drainage for irrigated land
b) Conjunctive use of water in the basin
c) Lining of canals and water courses
d) Contour bunding

Canal Structures

1. The best Energy dissipation on the downstream side of a canal drop is caused in:
a) Sarda type Fall
b) Glacis Fall
c) Ogee Fall
d) Montague Fall

2. What is the height of the centre of pressure above the water level in the inlet well if the R.L of the centre of pressure is 150.83 m and the R.L of water level in inlet well is 148.30 m?
a) 2.53 m
b) 1.78 m
c) 3 m
d) 1.99 m

3. The relative bed levels of the canal and the drainage may be changed and manipulated by _____
a) changing the alignment
b) changing the positions of the water table
c) altering the head level
d) use of dewatering equipment

4. The channel constructed to bypass the excess water entering a canal, is called a
a) Canal module
b) Canal siphon
c) Canal escape
d) Canal regulator

5. Which among the following is not true about Asphaltic concrete Lining?
a) It is fairly cheap
b) It is flexible and readily confirms to subgrade
c) It permits certain type of weed growth
d) It decreases the rugosity coefficient to increase channel efficiency

6. A trapezoidal notch fall can maintain normal water depth in the upstream channel:
a) At any one given value of its design discharge
b) At all the discharges
c) At any two values of the design discharges
d) At no discharge at all

7. The depth-discharge relationship of the upstream canal remains practically unaffected by the introduction of a fall of the type___
a) Ogee fall

b) Sarda type vertical fall
c) Trapezoidal notch fall
d) Inglis fall

8. The drainage water is sometimes allowed to join the canal water augment canal supplies, through a hydraulic structure, called a:
a) Canal outlet
b) Canal inlet
c) Module
d) Level crossing

9. A canal headworks has nothing to do with a:

a) Weir
b) Guide bank
c) Head regulator
d) Safety Ladder

10. The canal water flows freely under gravity in which of the following CD works?
a) Aqueduct and Super passage
b) Super passage and Syphon
c) Canal Syphon and Aqueduct
d) Level-crossing and inlets outlets

11. The canal regulator which is constructed at a diversion headworks, is called a :
a) Cross regulator
b) Distributary head regulator
c) Canal module
d) Canal siphon

12. A Super passage is the reverse of _____
a) syphon
b) aqueduct
c) inlets and outlets
d) syphon Aqueduct