SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR

Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code : GE-II(13A01702)   **Course & Branch**: B)Tech - CE

Year & Sem: IV-B)Tech & I-Sem   **Regulation:** R13

UNIT –III
EARTH PRESSURE THEORIES AND RETAINING WALLS

1. Describe in detail the Culuman's graphical method for Active and passive earth pressure determination on retaining wall. Give the procedure in steps for both the active and passive cases. **[10M]**

2. A masonry retaining wall of trapezoidal section is 6m high and 1m wide at top, retaining soil level with its top. Find the minimum base width of the wall to avoid tension at the base. γ of masonry is 23 kN/m3 and γ of the soil is 16kN/m3; Φ is 30^0. The back face of the wall is vertical. **[10M]**

3. A Gravity retaining wall with a vertical face is 6 m high. Its width at top is 1.5 m and at its base is 4 m. γ of masonry is 20 kN/m3. Find up to what height can a soil having γ =25 kN/m3 be retained by this wall so that the Max pressure at the base will be 1.2 times the minimum pressure at the base Φ is 30^0. **[10M]**

4. Explain in detail the main design considerations for retaining walls and check for stability.**[10M]**

5. What are the various types of earth pressures? Give field example for each type. **[10M]**

6. A 10m high retaining wall with smooth vertical back supports a horizontal backfill Φ is 33^0, c= 25kPa, Density above water table 15kN/$m3$ and below water table 18kN/$m3$). The water table is at a depth of 3m below the surface of the backfill. The backfill supports a surcharge of 10kPA) Determine the magnitude and line of action of passive earth pressure. **[10M]**

7. A)Why retaining walls are usually designed for active earth pressure? **[5M]**
   B) Compare the Rankine's and Coulomb's earth pressure theories. **[5M]**

8. A retaining wall has a smooth vertical back and is 8.5m in height. It retains a horizontal backfill of sand with Φ is 33^0 .Find out the total active earth pressure per meter length of wall if γ =18kN/$m3$.
   The water table is far below the base of the wall.
   The water table rises up to 4.5m level above the base. Take at=20.5kN/$m3$ **[10M]**

9. Explain how the stability of a gravity retaining wall is checked against:
   A) Sliding   B) Overturning
   C) Bearing capacity failure. **[10M]**

10. A) What are different types of earth pressures? **[2M]**
    B) What are the assumptions of Rankine's theory? **[2M]**
    C) What are the assumptions in Coulomb's theory? **[2M]**
    D) Compare Rankine's theory and Coulomb's theory? **[2M]**
    E) Explain trail wedge method? **[2M]**

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1. The earth pressure at rest is defined as the lateral pressure exerted by soil   [   ]
   A) When it is at rest
   B) When the retaining wall has no movement relative to backfill
   C) When the retaining wall tends to move away from backfill
   D) When the retaining wall moves into the soil
2. The lateral earth pressure exerted by the soil when the retaining wall moves into the soil, is known as
   A) Earth pressure at rest   B) active earth pressure   [   ]
   C) Passive earth pressure   D) total earth pressure
3. The earth pressure at rest is calculated by using   [   ]
   A) Euler's theory   B) Rankine's theory   C) Bending theory   D) Theory of elasticity
4. The coefficient of earth pressure at rest for loose sand is _____ that of dense sand   [   ]
   A) More than   B) less than   C) equal to   D) none of the above
5. The coefficient of earth pressure at rest for stiff clay is about   [   ]
   A) 0.4 B) 0.5   C) 0.6   D) 0.8
6. The coefficient of passive earth pressure is 1/3, then the coefficient of active earth pressure is
   A) 1/3   B) 1   C) 3/2   D) 3   [   ]
7. The coefficient of active earth pressure for a loose sand having an angle of internal of 30^0, is
   A) ½   B) 1/3   C) 1   D) 3   [   ]
8. The active earth pressure is proportional to   [   ]

   A) $\text{Tan}^2 [45^0+\frac{\phi}{2}]$ B) $\text{Tan}^2 [45^0-\frac{\phi}{2}]$ C) $\cot^2 [45^0 +\frac{\phi}{2}]$ D) $\cot^2 [45^0-\frac{\phi}{2}]$

9. The passive earth pressure is proportional to   [   ]

   A) $\text{Tan}^2 [45^0 +\frac{\phi}{2}]$ B) $\text{Tan}^2 [45^0 - \frac{\phi}{2}]$ C) $\cot^2 [45^0 +\frac{\phi}{2}]$ D) $\cot^2 [45^0 - \frac{\phi}{2}]$

10. In case of cohesive soils, vertical cuts can be made is proportional to   [   ]

   A) $\text{Tan}^2 [45^0 +\frac{\phi}{2}]$ B) $\text{Tan}^2 [45^0 - \frac{\phi}{2}]$ C) $\cot^2 [45^0 +\frac{\phi}{2}]$ D) $\cot^2 [45^0 - \frac{\phi}{2}]$

11. The inclination of the failure plane behind a vertical wall in the passive pressure case is inclined to the
    Horizontal at   [   ]
   A) 45-φ/2   B) 45 – φ   C) 45+φ/2   D) 45+φ
12. The yield of retaining wall required to reach plastic equilibrium in active case is   [   ]
   A) More than that in the passive case   B) less than that in the passive case
   C) Equal that in the passive case   D) none of the above
13. The active earth pressure coefficient ka generally refers to   [   ]
A) Effective stresses   B) total stresses   C) neutral stresses   D) all the above
14. The active pressure caused by cohesion less backfill on a smooth vertical retaining wall may be
    Reduced by   [   ]
A) Compacting the backfill   B) providing a surcharge load on the backfill
C) Saturating the backfill with water   D) none of the above
15. The total active pressure after the development of tension cracks is equal to   [   ]

A) $\frac{1}{2}\gamma H^2 ka - 2c'H\sqrt{Ka}$

B) $\frac{1}{2}\gamma H^2 ka + 2c'H\sqrt{Ka}$

C) $\frac{1}{2}\gamma H^2 ka - 2c'H\sqrt{Ka} - 2\frac{c^2}{\gamma}$

D) $\frac{1}{2}\gamma H^2 ka - 2c'H\sqrt{Ka} + 2\frac{c^2}{\gamma}$

16. The radius of friction circle is equal to [   ]
A) Rsinφ B) Rtanφ   C) Rcosφ   D) Rφ

17. If a uniform surcharge of 120 kN/m2 is placed on the backfill with φ' = 300, the increase in pressure is
A) 12 kN/m2   B) 30 kN/m2   C) 40 kN/m2   D) 120 kN/m2   [   ]

18. The critical height of an unsupported vertical cut in a cohesive soil is given by
A) 4C tan α   B) 4C cot α   C) 2C tan α   d . 2C cot α
        γ   γ   γ   γ

19. the coefficient of active earth pressure for a loose sand having an angle of internal friction of 300 is
A) 1/3   b 3   C) 1   D) ½   [   ]

2. Rankine's theory of earth pressure assumes that the back of the wall is
A) Plane and smooth   B) plane and rough C) vertical and smooth   D) vertical and rough

21. The major pricincipal stress in an element of cohesion less soil within the backfill of a retaining wall is
A) Vertical if the soil is in an active state of plastic equilibrium   [   ]
B) Vertical if the soil is in a passive state of plastic equilibrium
C) Inclined at 450 to the vertical plane
D) None of the above

22. Total lateral earth pressure is proportional to   [   ]
A) Depth of soil   B) square of depth of soil
C) Angle of internal friction of soil   D) none of the above

23. A retaining wall retains a sand strata with φ= 300 up to its top. If uniform surcharge of 12 t/m2 subsequently put on the sand strata, then the increase in the lateral earth pressure intensity on the retaining wall will be _____ t/m^2 [   ]
A)   1   B) 2   c 4   8

24. The active earth pressure coefficient Ka generally refers to   [   ]
A) Effective stresses   B) total stresses   C) neutral stresses D) all the above

25. The active earth pressure caused by cohesion less backfill on a smooth vertical retaining wall may be reduced by   [   ]
A) compacting the backfill   B) providing a surcharge load on the backfill
C) Saturating the backfill with water   D) none of the above

26. The maximum vertical depth of excavation that can be made in saturated soft clay,   [   ]
Having C = 30 kN/m2 and γ= 20 kN/m3 without any lateral support is
A) 3m   B) 6m   C) 2.67m   D)8m

27. The wall friction present on the retaining wall   [   ]
A) Decreases the active earth pressure but increases the passive pressure
B) Decreases the passive earth pressure but increases the active pressure
C) Decreases both active earth pressure and the passive pressure
D) Increases both the active earth pressure and the passive pressure

28.Coulomb's theory is applicable for   [   ]
A) Homogeneous soils only   B) non homogeneous soils also
C) Smooth retaining walls only   D) soils which have angle of internal friction only

29. Identify the incorrect statement. Lateral pressure can also be developed under the following conditions
A) Earthquake   B) swelling pressure   C) ice formation   D) over consolidation

30. Coulomb's earth pressure theory is based on the following assumptions: [   ]
1. The backfill is saturated cohesion less soil.
2 The position and line of action of the earth pressure are known
3. The failure surface is a continuous non – plane surface

4. The single wedge is considered to be a rigid body.
A) 1 & 2 are correct   B) 2&4 are correct   C) 3&4 are correct   D) 1&4 are correct.

31. The effect of cohesion on a soil is to   [   ]
A) Reduce both the active earth pressure intensity and passive earth pressure intensity
B) Increase both the active earth pressure intensity and passive earth pressure intensity
C) Reduce the active earth pressure intensity and increase passive earth pressure intensity
D) Increase the active earth pressure intensity and reduce the passive earth pressure intensity

32. Coefficient of earth pressure at rest is   [   ]
A) < active earth pressure but > passive earth pressure
B) > active earth pressure but < passive earth pressure
C) > both the active earth pressure and passive earth pressures
D) < both the active earth pressure and passive earth pressures

33. The inclination of the failure plane behind a vertical wall in the passive pressure case is inclined to the horizontal at   [   ]
A) $45^0 – \varphi/2$ B) $45^0 – \varphi$ C) $45^0 + \varphi/2$ D) $45^0 + \varphi$

34. The basement walls are generally designed for   [   ]
A) Active pressure   B) passive pressure   C) at rest pressures   D) none of the above.

37. The average angle of wall friction, δ in terms of φ, according to Terazaghi is   [   ]
A) $\delta = (1/3)\varphi$ B) $\delta = (2/3)\varphi$ C) $\delta = (1/2)\varphi$ D) $\delta = \varphi$

38. In a cohesion less soil deposit having a unit weight of 1.5 t/m3 and $\varphi = 30^0$, the active and passive lateral earth pressure intensities (in t/m2) at a depth of 10 m will respectively, be   [   ]
A) 15 and 5   b 5 and 45   c 10 and 20   d 20 and 10

39. Consider the following statements: [   ]
Rankine's theory and coulomb's theory give same values of coefficients of active and passive earth pressure when
     1) The retaining wall has a vertical back
     2) The backfill is cohesion less
     3) Angle of slope of backfill is equal to the angle of internal friction
     4) Angle of slope of backfill is 0^0
     5) Angle of wall friction $\delta = 0^0$
     6) Angle of wall friction $\delta = \varphi$
Of these statements
A) 1,2,3,5 are correct   B) 1,2,4,5 are correct
C) 2,3,6 are correct   D) 1,4,6 are correct

40. Cohesive soils are   [   ]
A) Good for backfill because of low lateral pressure
B) Good for backfill because of high shear strength
C) Poor for backfill because of large lateral pressure
D) None of the above

41. The best backfill material should be   [   ]
1. Rigid   2. Free draining   3. With high angle of internal friction
4. capable of developing maximum earth pressure.
 Of these statements
A) 1, 2, 4 are correct   B) 1, 2, 3 are correct   C) 2, 3, 4 are correct   D) all are correct

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