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 –IV

SHALLOW FOUNDATIONS AND ALLOWABLE BEARING PRESSURE

1. A square footing of width 2.5m is positioned on medium dense sand at a depth of 2m from the ground surface. The sand has a void ratio e = 0.72, specific gravity of soil solids G = 2.65, and the angle of shearing resistance $\acute{A}$ =350. Adopting a factor of safety of 2.5m, find the safe load on the footing for the following water table positions:

A) at 5m from the ground surface

B) at 1.5m from the base of the footing, and

C) at 1.2m from the ground surface. **[10M]**

2. Discuss various empirical equations to determine safe bearing pressure of footings based on SPT Value (N)? **[10M]**

3. A) What is the function of a foundation? **[5M]**

B) Write in detail about the general types of foundations, with suitable sketches? **[5M]**

4. A Plate bearing test was conducted in a pure cohesive soil with 30 cm square plate at a depth of 1.5 m below the ground level. The water table was found to be at 6 m depth. Failure occurred at a load of 50 kN Find the factor of safety if a 1.2 m wide wall footing carries 140 kN/m run and the foundation is at a depth of 2m below ground level. **[10M]**

5. Determine the size of a square footing at the ground level to transmit a load of 900 kN in sand weighing 18 kN/m3 and having an angle of shearing resistance of 350 ($N\gamma$ = 46, Nq = 42) factor of safety is? **[10M]**

6. What will be the modification in the result, if the footing may be placed at a depth of 1m below ground surface? Assume, in this case, the water table may rise to the ground surface. γ = 9 kN/m3. **[10M]**

7. Derive the Terzaghi's bearing capacity expression for shallow strip footing. **[10M]**

8. How to find out the bearing capacity of stratified soil deposits? **[10M]**

9. Describe the procedure of determining the safe bearing capacity based on the standard penetration test? **[10M]**

10. A) What are the assumptions made in the derivation of Terzaghi's bearing capacity theory? **[2M]**

B) Write the equation of ultimate bearing capacity for Square footing and circular footing **[2M]**

C) Differentiate between general shear failure and local shear failure **[2M]**

D) Discuss the effect of water table on bearing capacity of the soil **[2M]**

E) Explain Vesic's bearing capacity theory **[2M]**

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1. Spread footing foundation is [ ]
A) deep foundation B) shallow foundation
C) suitable for black cotton soil D) both B) and C)
2. Spread footing foundation consists of [ ]
A) piles B) widened footings
C) concrete columns to support load of super structure D) none of the above
3. Usually a course of ___ is provided below the course of brick or stone masonry in spread footing.
A) Strong concrete [ ]
B) lean concrete
C) cement paste
D) crushed stone
4. The grade of cement concrete used in spread footing bottom support is [ ]
A) 1:2:4 B) 1:3:6
C) 1:4:8 D) either B) or C)
5. In spread footing, the thickness of concrete bed should not be less than [ ]
A) 10 cm B) 15 cm
C) 20 cm D) 30 cm
6. In above question, the projection of concrete bed should not be more than [ ]
A) 10 cm B) 15 cm
C) depth of concrete D) width of super structure wall
7. Various courses of spread footing are generally [ ]
A) 10 to 30 cm deep B) 20 to 30 cm deep
C) > 30 cm deep D) < 20 cm deep
8. In spread footing, offsets for brick masonry are generally [ ]
A) 5 cm B) 8 cm
C) 10 cm D) 15 cm
9. In above question, for stone masonry, offsets are [ ]
A) 5 cm B) 8 cm
C) 15 cm D) 30 cm
10. General thumb rules for spread footings are (T is thickness of wall) [ ]
A) width of foundation concrete is 2T + 30 cm
B) width of bottom most course of footing is 2T
C) depth of concrete block is (2/3)T
D) all the above

11. Terzaghi's analysis assumes: [ ]
A) Soil is homogeneous and isotropic
B) Elastic zone has straight boundaries inclined at $\psi = \varphi$ to the horizontal and plastic zones fully Developed
C) Failure zones do not extend above the horizontal plane through the base of the footing
D) All the above.

12. The ultimate bearing capacity of a soil is [ ]
A) Total load on the bearing area
B) Safe load on the bearing area
C) Load at which soil fails
D) Load at which soil consolidates.

13. The Terzaghi's general bearing capacity equation for a continuous footing is given by (where Nc, 2V& and Ny are bearing capacity factors.) [ ]
A) $qf = cNc + \gamma DNq + 0.5\gamma BN\gamma$
B) $qf = cNc - \gamma DNq + 0.5\gamma BN\gamma$
C) $qf = cNc + \gamma DNq - 0.5\gamma BN\gamma$
D) $qf = cNc - \gamma DNq - 0.5\gamma BN\gamma$

14. The bearing capacity of a soil depends upon [ ]
A) Size of the particles
B) Shape of the particles
C) Cohesive properties of particles
D) Internal frictional resistance of particles
E) All the above.

15. The maximum pressure which a soil can carry without shear failure, is called [ ]
A) Safe bearing capacity
B) Net safe bearing capacity
C) Net ultimate bearing capacity
D) Ultimate bearing capacity.

16. A shallow foundation is usually defined as a foundation which has [ ]
A) Depth less than 0.6m B) depth less than its width
A) Depth less than 1.0m D) depth equal to width

17. The ultimate bearing capacity of a shallow foundation is reduced to about _____ when the water table rises to the ground surface [ ]
A) 75% B) 50% C) 25% D) 10%

18. The allowable soil pressure for foundations in cohesive soil is generally controlled by [ ]
A) Settlements B) bearing capacity C) consolidation D) permeability

19. The immediate settlement of a rigid footing is about _____ times the maximum settlement of an equal flexible footing [ ]
A) 0.9 B) 0.8 C) 0.7 D) 0.6

20. The bearing capacity of soil supporting a footing of size 3m X 3m will not be affected by the presence of water table located at a depth below base of the footing of [ ]
A) 1.0 B) 1.50m C) 3.0m D) 6.0m

21. A 2m wide strip footing tests at a depth of 2 m below the ground surface where water table is at the ground surface. The ultimate load which the strip can carry according to Terzaghi's theory when Ysat = 20 kN/m3 and c = 30 kN/m2 is about [ ]
A) 171 kN/m B) 342 kN/m C) 422 kN/m D) 262 kN/m

22. The permissible settlement is the maximum in the case of [ ]
A) Isolated footing on clay B) raft on clay C) isolated footing on sand D) raft on sand

23. If the gross bearing capacity of a strip footing 1.5m wide located at a depth of 1m in clay is 400 kN/m2 , its net bearing capacity for Y = 20 kN/m3 is [ ]
A) 370 kN/m2 B) 380 kN/m2 C) 390 kN/m2 D) 360 kN/m2
24. Trapezoidal combined footings are required when [ ]
A) The space outside the exterior column is limited B) the exterior column is limited
B) The exterior column is heavier D) the space outside the exterior column is heavier
25. For the design of a strap footing, the following assumption is not made [ ]
A) The strap is perfectly rigid B) the soil pressure varies linearly
B) The interior footing is centrally loaded D) the strap is not subjected to any direct soil pressure
26. The conventional design of a rigid combined footing λL should be [ ]
A) Less than 0.8 B) between 0.8 and 3.0 C) more than 3.0 D) equal to 3
27. The coefficient of sub grade reaction depends upon [ ]
A) Size of footing B) shape of footing C) depth of footing D) all the above
28. According to Rankine's formula, the minimum depth of foundation when q = 180kN/m2, Y = 20 kN/m3 and ϕ = 30o is [ ]
A) 0.50m B) 0.75m C) 1.0m D) 2.0m
30. When the wind load is more than 25% of combined dead and live load, the safe bearing capacity is usually increased by [ ]
A) 15% B) 20% C) 25% D) 30%
31. The value of factor λL when B = 20cm, k = 20N/cm3 and l=300cm is [ ]
A) 1.0 B) 2.0 C) 3.0 D) 4.0
32. The ultimate bearing capacity of cohesion less soil depends upon [ ]
A) Width of footing B) depth of footing
C) Relative density D) all the above
33. The bearing capacity of a footing in pure clay soils is independent of [ ]
A) Depth of footing B) width of footing
C) Shape of footing D) water table
34. The seating load for plate load test is ____ kN/m^2 [ ]
A) 1 B) 5 c 7 D) 10
35. The bearing capacity of frozen soils depends on [ ]
A) Water content B) air content C) temperature D) creep
36. In pure clay the safe bearing capacity of footing is approximately equal to [ ]
A) Undrained cohesion B) unconfined compressive strength
C) Half of vane shear strength D) None of the above
37. Identify the incorrect statement. Bearing capacity of a footing on sand depends on [ ]
A) Depth of footing B) width of footing
C) Position of water table D) Undrained shear strength
38 The permissible settlement is the maximum in the case of [ ]
A) Isolated footing on clay B) raft on clay
C) Isolated footing on sand D) Raft on sand
39.The load carrying capacity of a foundation, if it is not back filled is [ ]
A) decreased B) increased C) no effect D) zero
40. In very soft clayey soils, the shear failure is generally [ ]
A) GSF B) LSF C) Punching shear D) None

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