2020

RANK Improvement WORKBOOK

Answer key and Hint of Objective & Conventional *Questions*

Civil Engineering

Soil Mechanics and Foundation Engg.

MADE EASY Publications

MADE EASY Publications

1 Properties of Soil

LEVEL 1 Objective Questions

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

LEVEL 2 Objective Questions

14. (b)
15. (a)
16. (d)
17. (c)
18. (c)
19. (d)
20. (a)
21. (b)
22. (c)
23. (d)
24. (d)

LEVEL 3 Conventional Questions

Solution : 1

$V_1 = 3558.59\ m^3$, $W_1 = 56937.44$ kN
$V_2 = 3666.43\ m^3$, $W_2 = 58662.83$ kN

Solution : 2

1. 48.2 g
2. 49.981%

Solution : 3

0.5035 m

Solution : 4

(i) 3295.19 g
(ii) 134.19 g

Solution : 5

Borrow area D is most economical.

Solution : 6

(i) Soil B (ii) Soil B (iii) Soil B (iv) Soil B
(v) Soil B

Solution : 7

20936 kg

Solution 8

2.63

Solution : 9

$\gamma_t = 1.82$ g/cc, $\gamma_d = 1.65$ g/cc, $I = 0.61$, $S = 45.4\%$, $W = 23\%$, $\gamma_{sat} = 2.02$ g/cc

Solution : 10

$W_s = 23.41\%$, G = 2.66, SR = 1.64

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2 Classification of Soils

LEVEL 1 Objective Questions

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

LEVEL 2 Objective Questions

12. (c)
13. (d)
14. (d)
15. (b)
16. (b)
17. (d)

LEVEL 3 Conventional Questions

Solution : 1

(a) 3%, 91%, 6.%
(b) 0.15 mm
(c) 13.33
(d) 0.602
(e) Poorly graded

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3 Effective Stress and Permeability

LEVEL 1 Objective Questions

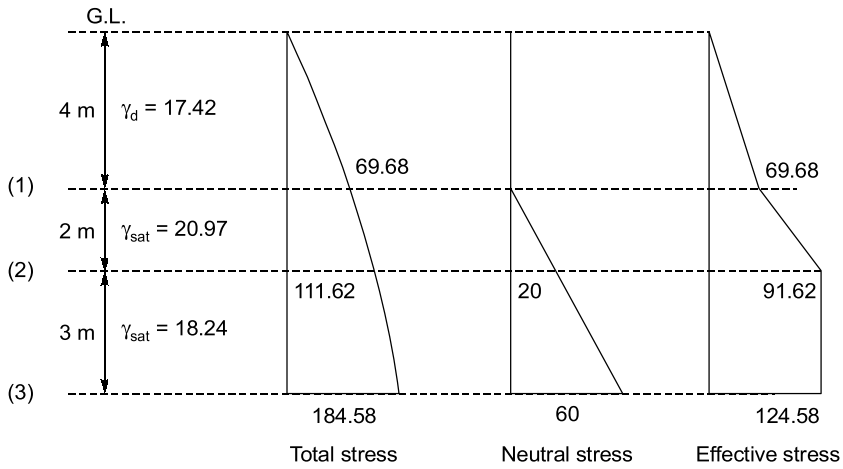
1. (b)
2. (a)
3. (a)
4. (b)
5. (d)
6. (c)
7. (d)
8. (a)

LEVEL 2 Objective Questions

9. (c)
10. (a)
11. (c)
12. (a)
13. (b)
14. (a)
15. (b)

LEVEL 3 Conventional Questions

Solution : 1



Solution : 2

(i) $\bar{\sigma}_{AA} = 41.1\ kN/m^2$

$\bar{\sigma}_{BB} = 69.1\ kN/m^2$

$\bar{\sigma}_{CC} = 97.1\ kN/m^2$

(ii) $\bar{\sigma}_{AA} = 57.7\ kN/m^2$

$\bar{\sigma}_{BB} = 69.1\ kN/m^2$

$\bar{\sigma}_{CC} = 97.1\ kN/m^2$

(iii) $\bar{\sigma}_{AA} = 57.7\ kN/m^2$

$\bar{\sigma}_{BB} = 85.7\ kN/m^2$

$\bar{\sigma}_{CC} = 113.7\ kN/m^2$

Solution : 3

(i) 40 cm
(ii) 24 cm, 64 cm
(iii) 0.033 cm/s
(iv) 0.02 m*l*/s

Solution : 4

1.537. 3.759

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4 Seepage Analysis

LEVEL 1 Objective Questions

1. (d)
2. (c)
3. (a)

LEVEL 2 Objective Questions

4. (a)
5. (d)
6. (b)
7. (c)
8. (d)
9. (b)
10. (c)

LEVEL 3 Conventional Questions

Solution : 1

3.382 m

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5 Compaction of Soil

LEVEL 1 Objective Questions

1. (b)
2. (b)
3. (a)
4. (a)
5. (c)

LEVEL 2 Objective Questions

6. (c)
7. (d)
8. (c)
9. (a)
10. (b)

6 Compressiblity and Consolidation

LEVEL 1 Objective Questions

1. (b)
2. (a)
3. (b)
4. (a)
5. (c)
6. (c)
7. (b)
8. (c)

LEVEL 2 Objective Questions

9. (c)
10. (d)
11. (a)
12. (a)

LEVEL 3 Conventional Questions

Solution : 1

4.91×10^{-4} cm^2/s

104.17 days, 450 days

Solution : 2

324.54 mm, 215.69 mm

Solution : 3

(i) 423 mm

(ii) 42.3 mm

(iii) 64.59 mm

Solution : 4

104 days

Solution : 5

82.79%

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7 Vertical Stress

LEVEL 1 Objective Questions

1. (b)
2. (a)
3. (c)
4. (a)
5. (b)
6. (d)
7. (b)
8. (d)

LEVEL 2 Objective Questions

9. (b)
10. (c)
11. (b)
12. (d)
13. (a)
14. (b)

LEVEL 3 Conventional Questions

Solution : 1

15.76 kN/m^2

Solution : 2

71.136 kN/m^2

Solution : 3

(i) 18.09 kN/m^2

(ii) σ_1 = 103 kPa, σ_3 = 34.5 kPa, θ = 17°

Solution : 4

21.5 kN/m^2, 9.186 %

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8 Shear Strength of Soil

LEVEL 1 Objective Questions

1. (b)
2. (c)
3. (c)
4. (b)
5. (a)
6. (c)
7. (d)
8. (b)
9. (c)
10. (a)
11. (c)
12. (d)

LEVEL 2 Objective Questions

13. (d)
14. (c)
15. (d)
16. (c)
17. (a)
18. (d)
19. (a)
20. (d)
21. (b)
22. (d)
23. (b)

LEVEL 3 Conventional Questions

Solution : 1

C = 0.044 N/mm^2, $\phi = 26.56°$

Solution : 2

(i) 31°

(ii) $\sigma_1 = 411.82$ kPa, $\sigma_3 = 131.82$ kPa

(iii) σ_1 makes an angle 60.5° to horizontal

Solution : 3

$C' = 0$, $\phi' = 22°$, $\phi_u = 15.8°$, $\sigma_1/s_3 = 1.75$, $\frac{\sigma_1'}{\sigma_3'} = 2.2$, A = 0.5

Solution : 4

(i) 32.242°

(ii) $\sigma_{1f} = 139.33$ kPa, $\sigma_{3f} = 42.39$ kPa

(iii) 0°, 61.12°, 151°, 14.12°

Solution : 5

C = 24.33 kPa, $\phi = 15.5°$, $C' = 3.58$ kPa, $\phi' = 27.7°$

Solution : 6

C = 61.984 kPa, $\phi = 20.137°$, $C' = 28.23$ kPa, $\phi' = 29.23°$

Solution : 7

137.62 kPa

Solution : 8

$\phi = 23.58°$, $\phi_c = 87.28$ kPa, $\sigma_1 = 966.7$ kPa, $\Delta\sigma_d = 666.7$ kPa

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9 Retaining Wall & Earth Pressure

LEVEL 1 Objective Questions

1. (c)
2. (b)
3. (b)
4. (c)
5. (a)
6. (b)
7. (c)
8. (b)
9. (a)
10. (c)
11. (c)

LEVEL 2 Objective Questions

12. (d)
13. (a)
14. (b)
15. (d)
16. (a)

LEVEL 3 Conventional Questions

Solution : 1

9.46 m

Solution : 2

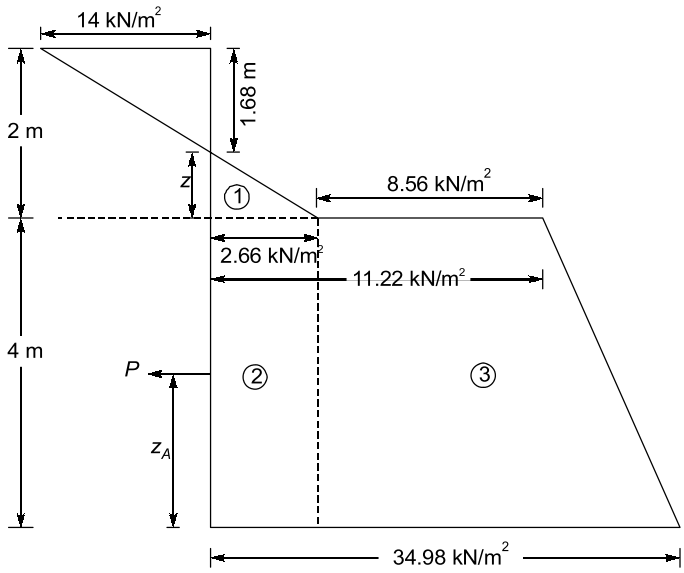
637.8 kN, 3.62 m

Change of application of force= –0.38 m.

Solution : 3

2.16 m

Solution : 4



Solution : 5

44.53 kN/m^2

(i) If tension cracks are developed = 0.99 m

(ii) If tension cracks are not developed= 0.147 m

Solution : 6

1.063 m

Solution : 8

33.172 kN/m

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10 Stability of Slope

LEVEL 1 Objective Questions

1. (a)
2. (c)
3. (c)
4. (c)
5. (c)

LEVEL 2 Objective Questions

6. (d)
7. (a)
8. (d)
9. (a)
10. (c)
11. (b)

LEVEL 3 Conventional Questions

Solution : 1

(i) 4.47

(ii) 1.37

Solution : 2

57°

Solution : 3

2.15

$f_{C\,min} = 2.07$

Solution : 4

1.67, 0.697

Solution : 5

(a) 1.36

(b) 1.26

$F_s = 1.31, \quad F_\phi = 1.84, \quad F_c = 1.95$

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11 Shallow Foundations

LEVEL 1 Objective Questions

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

LEVEL 2 Objective Questions

11. (d)
12. (b)
13. (a)
14. (c)
15. (b)
16. (b)
17. (b)
18. (c)
19. (c)
20. (c)

LEVEL 3 Conventional Questions

Solution : 1

374.796 kN

Solution : 2

2.2 m

Solution : 3

322.78 kN/m

Solution : 4

(i) 106.63 kN/m^2

(ii) 55.71 mm

Solution : 5

(i) 127.035 kN/m^2

(ii) 121.62 kN/m^2

Solution : 6

(i) 810 kN/m^2

(ii) 794.4 kN/m^2

Solution : 7

1.65 m × 1.65 m

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12 Deep Foundation

LEVEL 1 Objective Questions

1. (c)
2. (b)
3. (c)
4. (b)
5. (d)
6. (d)
7. (d)
8. (b)

LEVEL 2 Objective Questions

9. (d)
10. (b)
11. (b)
12. (c)
13. (c)
14. (b)
15. (b)
16. (a)
17. (d)
18. (d)
19. (d)

LEVEL 3 Conventional Questions

Solution : 1

5386.08 kN, $\eta_g = 48.4\%$

Solution : 2

559.14 kN

Solution : 3

5218.97 kN

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13 Soil Exploration and Dynamics

LEVEL 1 Objective Questions

1. (a)
2. (a)
3. (b)
4. (c)

LEVEL 2 Objective Questions

5. (b)
6. (c)
7. (b)
8. (a)

LEVEL 3 Conventional Questions

Solution : 1

$C_i = 2.85\%$, $C_o = 1.33\%$, $A_R = 17.87\%$

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