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2007, OUTRAM LINES, 1ST FLOOR, OPPOSITE MUKHERJEE NAGAR POLICE STATION, DELHI-110009

Answer-key & Solution

SSC JE (SOIL MECHANICS)
Date 03.9.2017

1. B	13. C	25. C	37. B	49. A	61. A	73. B	85. D
2. C	14. B	26. D	38. D	50. B	62. C	74. C	86. C
3. A	15. B	27. D	39. B	51. A	63. C	75. A	87. D
4. C	16. D	28. C	40. C	52. C	64. A	76. B	88. C
5. C	17. A	29. D	41. A	53. C	65. B	77. B	89. B
6. B	18. A	30. B	42. D	54. C	66. D	78. A	90. B
7. C	19. A	31. B	43. C	55. B	67. B	79. B	
8. C	20. D	32. D	44. A	56. C	68. C	80. A	
9. B	21. B	33. A	45. C	57. C	69. B	81. D	
10. C	22. B	34. C	46. A	58. C	70. A	82. D	
11. C	23. C	35. D	47. D	59. A	71. C	83. C	
12. B	24. C	36. D	48. A	60. C	72. C	84. A	

Note : *If your opinion differ regarding any answer, please message the mock test and Question number to 9560620353*

Note : *If you face any problem regarding result or marks scored, please contact : 9313111777*

SOLUTION

2. (C) Activity = $\frac{\text{Plasticity Index}}{\% \text{ of clay fraction}} = \frac{W_L - W_P}{\%C}$

$$= \frac{65 - 29}{24} = 1.5$$

4. (A) Shrinkage limit $W_s = \frac{e}{G} \times 100$

$$e = 2.7 \times \frac{10}{100} \quad [s = 100\%]$$

$$= .27$$

$$\eta = \frac{e}{1+e} \times 100 = \frac{.27}{1+.27} \times 100 = 21.2\%$$

6. (B) $s = 100\%$

$$w = \frac{se}{G} = \frac{100 \times .78}{2.60} = 30\%$$

7. (C) At shrinkage limit, soil is fully saturated

$$w_s = \frac{e}{G} \times 100 = \frac{.5}{2.7} \times 100 = 18.5\%$$

8. (C) Liquidity Index

$$\frac{W - W_p}{W_L - W_p} = \frac{50 - 35}{60 - 35} = \frac{15}{25} = .6$$

$$\text{Consistency Index} = 1 - .6 = .4$$

10. (C) $\gamma_{\text{sat}} = \gamma_d (1 + w)$

$$= 1.5 \times 1.5 = 2.25 \text{ g/cc}$$

$$\gamma_{\text{sub}} = \gamma_{\text{sat}} - \gamma_w$$

$$= 2.25 - 1 = 1.25 \text{ g/cc}$$

15. (B) Dry wt = $1600 \times 10^{-4} = .16 \text{ kg}$
wt of water in soil before mixing
 $= .18 - .16 = .02 \text{ kg}$
wt of water after mixing
 $= .02 + .02 = .04 \text{ kg}$

$$\text{Water content} = \frac{.04}{.16} \times 100 = 25\%$$

16. (D) $V_s = 2V_v$

$$e = \frac{V_v}{V_s} = .5$$

$$n = \frac{e}{1+e} = \frac{.5}{1.5} = \frac{1}{3} = 33.33\%$$

17. (A) $I_p = W_L - W_P$

$$W_p = W_L - I_p = 40 - 20 = 20\%$$

18. (A) $\gamma_d = \left(\frac{G}{1+e} \right) \gamma_w$

$$18 = \frac{2.7}{1+e} \times 10$$

$$e = .5$$

21. (B) Activity = $\frac{I_p}{\% \text{ clay particles}}$

$$= \frac{25}{15} = 1.67$$

It is active soil as activity is more than 1.25

22. (b) $es = wg$

$$s = \frac{2.6 \times 50}{1.3} = 100\%$$

23. (C) Relative density Index = $\frac{e_{\text{max}} - e}{e_{\text{max}} - e_{\text{min}}} = .6$

Void ratio in loosest state $e_{\text{max}} = .9$

Void ratio in natural state $e_{\text{max}} = .6$

$$.9 - e_{\text{min}} = \frac{.9 - .6}{.6}$$

$$e_{\text{min}} = .9 - .5 = .4$$

27. (D) $es = wg$

$$e = \frac{wG}{s} = \frac{2.6 \times 20}{100} = .52$$

$$\eta = \frac{e}{1+e} = .34$$

$$\gamma_{\text{sat}} = \left(\frac{G+e}{1+e} \right) \gamma_w$$

$$= \frac{2.6 + .52}{1 + .52} \times 100 = 20.53 \text{ kN/m}^3$$

If γ_w is taken as 9.81 kN/m^3

$$\gamma_{\text{sat}} = 20.14 \text{ kN/m}^3$$

33. (A) $\eta = \frac{e}{1+e} = \frac{.5}{1+.5} = \frac{1}{3}$

seepage velocity = $\frac{\text{discharge velocity}}{\text{porosity}}$

$$= \frac{6 \times 10^{-7}}{(1/3)}$$

$$= 18 \times 10^{-7} \text{ m/s}$$

38. (D) Total stress $\sigma = 2 \times 5 = 10 \text{ t/m}^2$

Neutral stress $u = 1 \times 5 = 5 \text{ t/m}^2$

Effective stress $\bar{\sigma} = \sigma - u = 10 - 5 = 5 \text{ t/m}^2$

41. (A) $\Delta H = \frac{H(e_o - e_f)}{1 + e_o}$

$$= \frac{3 \times 10^{-2} \times (.9 - .71)}{1 + .9} = 30 \text{ cm}$$

58. (C) $i_c = \frac{G-1}{1+e} = \frac{2.62-1}{1+.62} = 1$

$$i = \frac{H}{l}$$

$$H = i \times l$$

$$= 1 \times 2.5 = 2.5 \text{ m}$$

76. (B) $S = C + \sigma_n \tan \phi$

$$C = S - \sigma_n \tan \phi$$

77. (B) For sand ; $C = 0$

$$\sigma_1 = \sigma_3 N\phi$$

$$N\phi = \tan^2 \left(45 + \frac{\phi}{2} \right)$$

$$\sigma_1 = 100 + 50$$

$$= 150 \text{ kPa}$$

$$\sigma_3 = 50 \text{ kPa}$$

$$150 = 50 N\phi$$

$$N\phi = 3$$

$$\therefore \sqrt{3} = \tan \left(45 + \frac{\phi}{2} \right)$$

$$\phi = 30^\circ$$