Objective Question Practice Programe

Date: 30 April, 2016

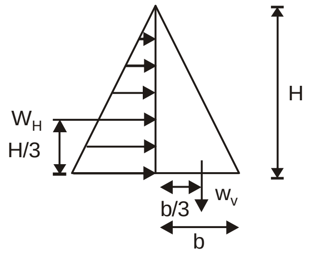
CE–Test - 19 (OBJECTIVE SOLUTION)...

ANSWERS

1.	(a)	21.	(c)	41.	(b)	61.	(b)	81.	(c)	101.	(d)
2.	(b)	22.	(a)	42.	(b)	62.	(a)	82.	(c)	102.	(c)
3.	(b)	23.	(c)	43.	(b)	63.	(b)	83.	(b)	103.	(a)
4.	(d)	24.	(d)	44.	(a)	64.	(a)	84.	(c)	104.	(d)
5.	(a)	25.	(b)	45.	(c)	65.	(b)	85.	(a)	105.	(d)
6.	(d)	26.	(c)	46.	(b)	66.	(c)	86.	(b)	106.	(a)
7.	(a)	27.	(c)	47.	(b)	67.	(d)	87.	(b)	107.	(b)
8.	(b)	28.	(b)	48.	(d)	68.	(c)	88.	(a)	108.	(a)
9.	(a)	29.	(b)	49.	(b)	69.	(b)	89.	(d)	109.	(d)
10.	(b)	30.	(b)	50.	(c)	70.	(b)	90.	(c)	110.	(c)
11.	(a)	31.	(d)	51.	(b)	71.	(b)	91.	(b)	111.	(a)
12.	(d)	32.	(d)	52.	(c)	72.	(b)	92.	(b)	112.	(a)
13.	(b)	33.	(d)	53.	(b)	73.	(d)	93.	(b)	113.	(a)
14.	(c)	34.	(c)	54.	(c)	74.	(c)	94.	(c)	114.	(a)
15.	(c)	35.	(c)	55.	(c)	75.	(d)	95.	(d)	115.	(a)
16.	(b)	36.	(c)	56.	(d)	76.	(b)	96.	(a)	116.	(a)
17.	(a)	37.	(b)	57.	(b)	77.	(c)	97.	(a)	117.	(d)
18.	(d)	38.	(b)	58.	(b)	78.	(d)	98.	(a)	118.	(c)
19.	(a)	39.	(b)	59.	(c)	79.	(d)	99.	(b)	119.	(a)
20.	(b)	40.	(d)	60.	(b)	80.	(b)	100.	(c)	120.	(a)

1. (a) $W_v = \frac{1}{2} Y_w (G-1) Hb$

$W_H = \frac{1}{2} Y_w H^2$



$$\sigma_{v\ toe} = \frac{w_v}{b \times 1} + \frac{[W_v \times b/6 - W_H \times H/3]}{\frac{b^3 \times 1}{12}}$$

$$= \frac{W_v}{b \times 1}\left(1 + \frac{2}{b}\right) - \frac{W_H \cdot H \cdot 4}{b^3} = 0$$

$$= \frac{\frac{1}{2}\gamma_w (G-1) Hb}{b \times 1}\left(1 + \frac{2}{b}\right) = \frac{\frac{1}{2}\gamma_w H^2 \times H \times 4}{b^3}$$

$$H = \sqrt{\frac{(G-1)b^3}{4}\left(1 + \frac{2}{b}\right)}$$

$$H = \sqrt{\frac{(2.25-1) \times 5^3}{4} \times \left(1 + \frac{2}{5}\right)}$$

$$\boxed{H = 7.4 \text{ m}}$$

2. (b)

3. (b)

4. (d)

5. (a)

6. (d)

7. (a)

8. (b)

9. (a)

10. (b)

$$D = \frac{8.64B}{\Delta}$$

For kor period of 25 days

$$D = \frac{8.64 \times 25}{0.15}$$

$= 1440$ ha/(m^3/s)

$$\text{Discharge, } Q = \frac{2800}{1440} = 2 \text{ m}^3\text{/s}$$

$= 2$ m^3/s

11. (a)

12. (d)

13. (b)

14. (c)

15. (c)

16. (b)

17. (a)

18. (d)

NIR = 10 – 3 = 7 cm

$$\text{FIR} = \frac{100}{80} \times 7 = 8.75 \text{ cm}$$

$$\text{GIR} = \frac{8.75}{87.5} \times 100 = 10 \text{ cm}$$

19. (a)

20. (b)

21. (c)

22. (a)

23. (c)

24. (d)

25. (b)

26. (c)

27. (c)

28. (b) Specific yield

$$= \frac{\text{volume of water extracted}}{\text{Total volume of water bearing strata}} \times 100$$

$$= \frac{5\text{m}^3}{2\text{m} \times 10\text{m}^2} \times 100$$

$$\boxed{S_y = 25\%}$$

29. (b) Scour depth, $R = 1.35\left(\frac{q^2}{f}\right)^{1/3}$

$R \ \alpha \ q^{2/3}$

$$\frac{R_2}{7.4} = \left(\frac{30}{10}\right)^{2/3}$$

$$\boxed{R_2 = 15.40 \text{ m}}$$

30. (b)

31. (d)

32. (d) Q = 30 m^3/sec d_{mm} = 0.3 mm

silt factor f $= 1.76\sqrt{d_{mm}}$

$$f = 1.76 \times \sqrt{0.3}$$

$$f = 0.964$$

average velocity $v = \left(\frac{Qf^2}{140}\right)^{1/6}$

$$= \left(\frac{30 \times 0.964^2}{140}\right)^{1/6}$$

$$\boxed{v = 0.764\ m/sec}$$

33. (d)

34. (c)

35. (c)

36. (c)

37. (b)

38. (b)

39. (b)

40. (d)

$$T = 2.3\frac{y}{f}\log_{10}\left(\frac{Q}{Q - f.A}\right)$$

⇒ Q = 0.043 ×60×60m^3/h = 154.8 m^3/h

$$T = 2.3 \times \frac{0.0635}{0.05}\log_{10}\left(\frac{154.8}{154.8 - 0.05 \times 3030}\right)$$

$$\boxed{T = 4.88\ hour}$$

41. (b)

42.(b) Area of rice transplantation = $\frac{65}{100} \times 800 = 520$ ha

irrigation required for transplantation of rice is given by,

Δ =Depth of water required by the crop – useful rainfall = 60 – 15 = 45 cm

duty at the head of distributory

$$= \frac{8.64\ B}{\Delta} = \frac{8.64 \times 15}{0.45} = 288\ ha/cumec$$

Duty at the head of field channel

= 288 × (1 – 0.25) = 216 ha/cumec

43. (b) Available moisture content = 18 – 10 = 8%

At 50% depletion available moisture content = $\frac{8\%}{2} = 4\% = 0.04$

depth of irrigation

$$= \frac{\gamma_d}{\gamma_w} \times d \times M.C = \frac{1480}{1000} \times 1.2 \times \frac{4}{100} = 71\ mm$$

∴ Frequency of irrigation

$$= \frac{d}{C_u} = \frac{71}{6} = 11.38\ day \simeq 11\ days$$

44. (a) Area to be irrigated

$$= 18{,}000 \times \frac{48}{100} = 8640\ ha$$

$$\text{Duty } D = \frac{8.64\ B}{D} = \frac{8.64 \times 30}{120 \times 10^{-3}} = 2160\ m^3/s$$

$$\therefore \text{Outlet discharge} = \frac{\text{Area to be irrigated}}{\text{Duty of crop}}$$

$$= \frac{8640}{2160} = 4\ m^3/s$$

45. (c)

Available moisture =Field capacity – Permanent wilting point

⇒ 28 – 13 = 15%

Hence, readily available moisture

= 0.8 × 15 = 12%

Depth of water stored in root zone

$$= \frac{\gamma_d . d}{\gamma_w}(F.C - O.M.C)$$

= 1.3 × 0.72 (0.28 – 0.16) = 0.1123 m

= 11.23 cm

1.0 cm of water is utilised by the plant in 1 day

11.23 cm of water will be utilised by the plant in

$$= \frac{1 \times 11.23}{1.0} = 11.23\ days = 11\ days$$

46. (b)

47. (b)

48. (d)

49. (b)

50. (c)

Floor thickness, $t = \frac{h}{G-1}$

$h = 9 - (3.4 + 1.8) = 3.8$ m

$= \frac{3.8}{2.6-1} = 2.375$ m

51. (b)

52. (c)

53. (b)

54. (c)

$$\text{Thickness} = \frac{\text{Uplift pressure head}}{\text{Submerged specific gravity}} \times \text{(F.O.S.)}$$

$$= \frac{4.5}{1.85} \times 1.33 = 3.23$$

55. (c)

56. (d)

57. (b)

G.C.A. = 8000 ha

C.C.A. = G.C.A. – Reserved forests etc

= 8000 – 1600

= 6400 ha

Land under irrigation = 0.5 × 6400 = 3200 ha

58. (b)

$$\text{available moisture} = \frac{\gamma_d}{\gamma_w} d(\text{F.C.} - \text{W.P.})$$

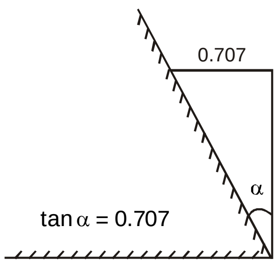
$$= \frac{1.5}{1.0} \times (0.30 - 0.10)$$

= 300 mm

59. (c)

60. (b)

$$\sigma_{toe} = p_v \sec^2\alpha - p' \tan^2\alpha$$



$= p_v \sec^2\alpha$ for zero tailwater depth

$\sec^2\alpha = [1 + (0.707)^2] = 1.50$

$\sigma_{toe} = 2.0(1.50) = 3.0$ MPa

61. (b)

If f_c = allowable compressive stress, the maximum height

$h_1 = \frac{f_c}{\gamma G}$ when there is uplift

$h_0 = \frac{f_c}{\gamma(G+1)}$ when uplift is neglected

$$\frac{h_1}{h_0} = \frac{G+1}{G} = \frac{2.5+1.0}{2.5} = 1.40$$

62. (a)

63. (b)

64. (a)

65. (b)

66. (c) A and B are free from local attraction.

Correction of station DE = 1° 15′

∴ Correct F.B of DE = 208° 1° 15′

= 209° 15′

67. (d)

68. (c)

B.B of Line = [(320° 30′ – 3° 30′) – 4° 15′] – 180° = 132° 45′

69. (b)

Magnetic bearing of line OE = 185 – 1.5

= 183.5

TB = M.B ± Declination = (183.5 + 3.5° E) = 187°

[T.B = 187°]

70. (b)

71. (b)

72. (b)

73. (d)

74. (c) Prism square is based on the same principle as the optical square and is used in same manner. It has an advantage over the optical square in that no adjustment is required, since the angle between the reflecting surfaces of prism is kept fixed.

75. (d) Lines joining the loci of places having same value of dip are known as isoclinic lines, whereas those joining the loci of places with no dip is called as aclinic line such as magnetic equator.

76. (b)

77. (c)

$$R_e = \frac{\rho V x}{\mu}$$

$$3.6 \times 10^5 = \frac{1000 \times 3 \times x}{0.001}$$

$$x = 0.12\text{m} = 12 \text{ cm}$$

$$\frac{\delta}{x} = \frac{5}{\sqrt{R_e}}$$

$$d = \frac{5 \times 10.12}{\sqrt{3.6 \times 10^5}} = 0.1 \text{ cm}$$

78. (d)

Drag force, $F_D = \frac{1}{2} C_D \times A \times \rho V^2$

$$= \frac{1}{2} \times 0.3 \times 3 \times 1.2 \times (20)^2$$

$$F_D = 216 \text{ N}$$

79. (d)

80. (b)

81. (c)

Given:

$\phi' = 30°$; $g_{sat} = 21$ kN/m^3; F = 2; b = ?

$$\gamma' = \gamma_{sat} - \gamma_w = \gamma_{submerged} = 21 - 10$$

$$= 11 \text{ kN/m}^3$$

Factor of safety, $F = \frac{\gamma' \tan\phi'}{\gamma_{sat} \tan\beta}$

$$\Rightarrow 2 = \frac{(\gamma_{sat} - \gamma_w) \tan 30°}{\gamma_{sat} \tan\beta}$$

$$\Rightarrow \tan\beta = \frac{(21 - 10) \tan 30°}{2 \times 21} = 0.15$$

$$\Rightarrow \beta = \tan^{-1}(0.15)$$

82. (c)

$K_0 = 1 - \sin\phi' = 0.5$

$P_0 = K_0 \gamma z = 0.5 \times 19 \times 8 = 76$ kN/m^2

Total thrust $= \frac{1}{2} P_0 \times H = 304$ kN

83. (b)

84. (c)

85. (a)

$$\frac{S_F}{S_P} = \left[\frac{B_F}{B_P}\left(\frac{B_P + 30}{B_F + 30}\right)\right]^2$$

$$S_F = 10\left[\frac{200}{30}\left(\frac{60}{230}\right)\right]^2 = \mathbf{30.245 \text{ m}}$$

86. (b)

87. (b)

88. (a)

$$\text{Risk} = 1 - q^n$$

$$= 1 - (1 - p)^n$$

$$= 1 - \left(1 - \frac{1}{T}\right)^n$$

$$= 1 - \left(1 - \frac{1}{50}\right)^{50}$$

$$= 1 - (0.98)^{50}$$

89. (d)

⇒ Loss due to elastic deformation occurs only in pre-tensioning

⇒ Loss due to friction occurs only in post-tensioning

⇒ Loss due to creep and shrinkage occurs in both

90. (c)

91. (b)

92. (b) In the transitional region of the boundary where the value of f depends on both Re and K/D.

93. (b) The values of K/δ' representing the boundary in transition are $0.25 < K/\delta' < 6$. Therefore, a pipe will behave as hydrodynamically smooth pipe if K/δ' is less than 0.25 and it will behave as hydrodynamically rough pipe when K/δ' greater than 6.0.

94. (c) In turbulent flow, velocity fluctuations cause a continuous interchange of fluid masses between the neighbouring layers, which is accompanied by a transfer of momentum. But the change in momentum is equivalent to the force in a perticular direction. Hence such momentum transport due to fluctuations results in developing additional shear stresses of high magnitude between adjacent layers.

95. (d) Displacement thickness

$$\delta^* = \int_0^{\delta}\left(1 - \frac{u}{U}\right)dy$$

$$= \int_0^{\delta}\left(1 - \frac{y}{\delta}\right)dy$$

$$= \delta - \frac{\delta}{2} = \frac{\delta}{2}$$

Momentum thickness

$$Q = \int_0^\delta \frac{u}{U}\left(1-\frac{u}{U}\right)dy$$

$$= \int_0^\delta \frac{y}{\delta}\left(1-\frac{y}{\delta}\right)dy$$

$$= \frac{\delta}{2}-\frac{\delta}{3}=\frac{\delta}{6}$$

$$\therefore \quad \frac{\delta^*}{Q}=\frac{\delta/2}{\delta/6}=3$$

96. (a)

Angle of shearing resistance,

$$\phi = 30°$$

Active earth pressure coefficient,

$$K_a = \frac{1-\sin\phi}{1+\sin\phi} = \frac{1-\sin 30°}{1+\sin 30°} = \frac{1}{3}$$

Active earth pressure at the base,

$$P_a = K_a\sigma_z = Ka\gamma z = \frac{1}{3}\times 18 \times 3 = 18 \text{ kN/m}^2$$

Active earth pressure at the base when water table is at the ground surface

$$Pa_2 = K_a\gamma_{sub}z + 1\times\gamma_\omega \times z$$

$$= \frac{1}{3}(18-10)\times 3 + 10\times 3$$

$$= 38 \text{ kN/m}^2$$

Change in earth pressure

$$= 38 - 18$$

$$= 20 \text{ kN/m}^2 \text{ (increase)}$$

97. (a)

98. (a) For areas of moderate sizes, such as involved for branch sewers, the maximum daily or hourly sewage flows can be expressed as:

Maximum daily flow = 2 times the average daily flow

Maximum hourly flow = 1.5 times the maximum daily = 3 times the average daily

99. (b)

$$\tau = \mu\frac{du}{dy}$$

$$= 10^{-3} \times 0.01[-1000 \times 2 \times y]$$

for y $= 1$ cm $= 0.01$m

$$\tau = 10^{-3} \times 0.01 [-2000 \times 0.01]$$

$$= 0.0002 \text{ N/m}^2$$

100. (c)

101. (d)

102. (c)

103. (a)

104. (d)

105. (d)

106. (a)

107. (b)

108. (a)

109. (d)

110. (c)

111. (a)

112. (a)

113. (a)

114. (a)

115. (a)

116. (a)

117. (d) If the plate is very smooth, even in the zone of turbulent boundary layer, there exists a very thin layer immediately adjacent to the boundary in which the flow is laminar.

118. (c) In actual practice, the friction leads to the development of larger active pressure than that estimated by Rankine's theory and the larger passive pressure than the theoretical.

119. (a)

Types of Sewer	Ratio of maximum flow to average flow
1. Trunk mains above 1.25 m in dia	1.5
2. Mains upto 1 m in dia	2.0
3. Branches upto 0.5 m in dia	3.0
4. Laterals and small sewers upto 0.25 m in dia	4.0

120. (a) The web near the portion of the stress concentration tends to fold over the flange.