# 2009-CE- 49-60

EE24BTECH11016 - DHWANITH M DODDAHUNDI

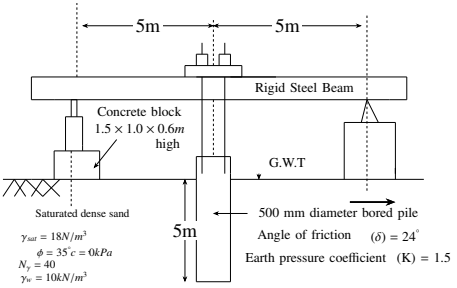
49) The magnetic bearing of a line AB was N 59°30' W in the year 1967, when the declination was 4°10' E. If the present declination is 3°W, the whole circle bearing of the line is

a) 299°20'
b) 307°20'
c) 293°40'
d) 301°40'

50) Determine the correctness or otherwise of the following **Assertion** [$a$] and **Reason** [$r$]:
**Assertion** [$a$]: Curvature correction must be applied when sights are long
**Reason** [$r$]: Line of collimation is not a level line but is tangential to the level line

a) Both [$a$] and [$r$] are true and [$r$] is the correct reason for [$a$]
b) Both [$a$] and [$r$] are true but [$r$] is **not** the correct reason for [$a$]
c) Both [$a$] and [$r$] are false
d) [$a$] is false but [r] is true

**Common data questions**
**Common data for questions 51 and 52**
Examine the test arrangement and the soil properties given below:




51) The maximum pressure that can be applied with a factor of safety of 3 through the concrete block, ensuring no bearing capacity failure in soil using Terzaghi's bearing capacity equation without considering the shape factor, depth factor and inclination factor is

a) 26.67 kPa
b) 60 kPa
c) 90 kPa

d) 120 kPa

52) The maximum resistance offered by the soil through skin friction while pulling out the pile from the ground is

a) 104.9 kN
b) 209.8 kN
c) 236 kN
d) 472 kN

**Common data for questions 53 and 54**

Following chemical species were reported for water sample from a well:

| Species | Concentration(milli equivalent/L) |
|---|---|
| Chloride($Cl^-$) | 15 |
| Sulphate($SO_4^{2-}$ | 15 |
| Carbonate($CO_3^{2-}$ | 05 |
| BiCarbonate($HC0_3^-$ | 30 |
| Calcium($Ca^{2+}$) | 12 |
| Magnesium($Mg^{2+}$) | 18 |
| pH | 8.5 |

53) Total hardness in mg/L as $CaCO_3$ is

a) 1500
b) 2000
c) 3000
d) 5000

54) Alkalinity present in the watr in mg/L as $CaCO_3$ is

a) 250
b) 1500
c) 1750
d) 5000

**Common data for questions 55 and 56**

One hour triangular unit of hydrograph of a watershed has a peak discharge of 60 $m^3/sec.cm$ at 10 hours and time base of 30 hours. The $\phi$ index is 0.4 cm per hour and base flow is 15 $m^3/sec$

55) The catchment area of the watershed is

a) 3.24 $km^2$
b) 32.4 $km^2$
c) 324 $km^2$
d) 3240 $km^2$

56) If there is rainfall of 5.4 cm in 1 hour, the ordinate of the flood hydrograph at $15^{th}$ hour is

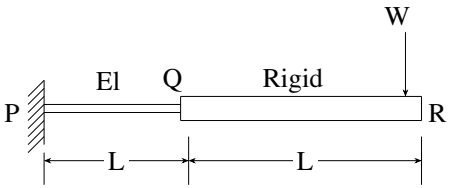
a) 225 $m^3/sec$

b) 240 $m^3/sec$
c) 249 $m^3/sec$
d) 258 $m^3/sec$

**Linked answer questions**

**Statement for Linked answer question 57 and 58**

In the cantilever beam PQR shown in figure below, the segment PQ has flexural rigidity El and the segment QR has infinite flexural rigidity.



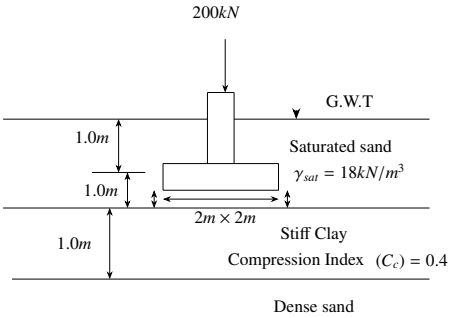

57) The deflection and slope of the beam at 'Q' are respectively
a) $\frac{5WL^3}{6El}$ and $\frac{3WL^2}{2El}$
b) $\frac{WL^3}{3El}$ and $\frac{WL^2}{2El}$
c) $\frac{WL^3}{2El}$ and $\frac{WL^2}{El}$
d) $\frac{WL^3}{3El}$ and $\frac{3WL^2}{2El}$

58) The deflection of the beam at 'R' is
a) $\frac{8WL^3}{El}$
b) $\frac{5WL^3}{6El}$
c) $\frac{7WL^3}{3El}$
d) $\frac{8WL^3}{6El}$

**Linked answer question 59 and 60**

59) A saturated undisturbed sample from a clay strata has moisture content of 22.22% and specific weight of 2.7. Assuming $\gamma_w = 10kN/m^3$, the void ratio and the saturated unit weight of the clay, respectively are
a) 0.6 and 16.875 $kN/m^3$
b) 0.3 and 20.625 $kN/m^3$
c) 0.6 and 20.625 $kN/m^3$
d) 0.3 and 16.975 $kN/m^3$

60) Using the properties of the clay layer derived from the above question, the consolidation settlement of the same clay layer under a square footing (neglecting its self weight) with additional data shown in the figure below (assume the stress distribution of IH:2V from the edge of the footing and $\gamma_w = 10kN/m^3$) is




a) 32.78 mm
b) 61.75 mm
c) 79.5 mm
d) 131.13 mm