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UPPSC-AE : 2021
ASSISTANT ENGINEER

CIVIL ENGINEERING

Test 2

Full Syllabus Test : Civil Engineering Paper-II + General Studies

ANSWER KEY

1.	(c)	26.	(d)	51.	(b)	76.	(d)	101.	(a)
2.	(a)	27.	(c)	52.	(b)	77.	(c)	102.	(d)
3.	(c)	28.	(d)	53.	(b)	78.	(c)	103.	(a)
4.	(c)	29.	(b)	54.	(b)	79.	(a)	104.	(b)
5.	(a)	30.	(c)	55.	(a)	80.	(a)	105.	(a)
6.	(b)	31.	(d)	56.	(c)	81.	(b)	106.	(d)
7.	(d)	32.	(b)	57.	(d)	82.	(b)	107.	(d)
8.	(a)	33.	(c)	58.	(b)	83.	(b)	108.	(a)
9.	(c)	34.	(d)	59.	(d)	84.	(a)	109.	(a)
10.	(b)	35.	(c)	60.	(d)	85.	(d)	110.	(c)
11.	(b)	36.	(d)	61.	(a)	86.	(d)	111.	(a)
12.	(d)	37.	(d)	62.	(d)	87.	(b)	112.	(c)
13.	(c)	38.	(a)	63.	(c)	88.	(d)	113.	(a)
14.	(d)	39.	(d)	64.	(c)	89.	(c)	114.	(b)
15.	(b)	40.	(b)	65.	(d)	90.	(c)	115.	(c)
16.	(d)	41.	(c)	66.	(c)	91.	(b)	116.	(b)
17.	(b)	42.	(c)	67.	(c)	92.	(c)	117.	(a)
18.	(c)	43.	(b)	68.	(c)	93.	(d)	118.	(a)
19.	(d)	44.	(c)	69.	(c)	94.	(b)	119.	(a)
20.	(a)	45.	(c)	70.	(d)	95.	(a)	120.	(b)
21.	(c)	46.	(c)	71.	(d)	96.	(d)	121.	(a)
22.	(a)	47.	(d)	72.	(b)	97.	(d)	122.	(c)
23.	(c)	48.	(a)	73.	(c)	98.	(b)	123.	(b)
24.	(a)	49.	(b)	74.	(b)	99.	(d)	124.	(c)
25.	(c)	50.	(b)	75.	(a)	100.	(b)	125.	(b)

DETAILED EXPLANATIONS

1. (c)

For sub-critical flow, $v < v_c$ and $y_c < y$ for super-critical flow, $v_c < v$ and $y < y_c$.

2. (a)

Given: $B = 4.5$ m, $y = 2.5$, $Q = 15$ m^3/s

$$F_r^2 = \frac{Q^2 T}{A^3 g}$$

$$F_r^2 = \frac{15^2 \times 4.5}{(2.5 \times 4.5)^3 \times 10}$$

$$F_r^2 = 0.071$$

$$F_r = 0.27 < 1, \text{ hence subcritical flow.}$$

$$E_1 = y_1 + \frac{Q^2}{2gA_1^2}$$

$$E_1 = 2.5 + \frac{15^2}{2 \times 10 \times (2.5 \times 4.5)^2}$$

$$E_1 = 2.59 \text{ m}$$

$$B_{2,\,\min} = \sqrt{\frac{27Q^2}{8gE_1^3}} = \sqrt{\frac{27 \times 15^2}{8 \times 10 \times 2.59^3}}$$

$$B_{2,\,\min} = 2.1 \text{ m}$$

Alternate:

$$E_1 = E_2$$

$$E_1 = \frac{3}{2}\left[\frac{\left(\frac{Q}{B_{2,\min}}\right)^2}{g}\right]^{1/3}$$

$$\Rightarrow \quad 2.59 = \frac{3}{2}\left[\frac{\left(\frac{15}{B_{2,\min}}\right)^2}{10}\right]^{1/3}$$

$$\Rightarrow \quad 3.72 = \left(\frac{15}{B_{2,\min}}\right)^{2/3}$$

$$B_{2,\,\min} = 2.09 \text{ m} \simeq 2.1 \text{ m}$$

5. (a)

Froude's number before jump, $F_{r_1} = \frac{v_1}{\sqrt{gy_1}}$

$$F_{r_1} = \frac{5}{\sqrt{9.81 \times 0.5}}$$

$$F_{r_1} = 2.26$$

$$Fr_2^2 = \frac{8F_{r_1}^2}{\left(-1+\sqrt{1+8F_{r_1}^{\ 2}}\right)^3}$$

$$Fr_2^2 = \frac{8 \times 2.26^2}{\left(-1+\sqrt{1+8 \times 2.26^2}\right)^3}$$

$$Fr_2^2 = 0.25$$

$$Fr_2 = 0.5$$

8. (a)

$$Q = \frac{2.303 \log\left(\frac{S_1}{S_2}\right)}{t} \times A \times S$$

$$Q = \frac{2.303 \log\left(\frac{2.7}{0.9}\right)}{100 \times 60} \times 20 \times 2$$

$$Q = 7.32 \times 10^{-3}\ m^3/s = 7.32\ lps$$

9. (c)

- Reflux valve : To restrict flow in one direction.
- Air valves : To ensure gravity flow under atmospheric pressure.
- Scour valves: To remove the sand, silt from pipe.

10. (b)

1 ml of 0.02 N H_2SO_4 = 1 mg of alkalinity as $CaCO_3$ in 500 m*l*

Given total alkalinity = 60 mg as $CaCO_3$.

$\Rightarrow$ Total alkalinity $= \frac{60}{500} \times 1000 = 120$ mg/*l* as $CaCO_3$.

Total hardness = 150 mg/*l* as $CaCO_3$

Now, Carbonate hardness = min.{Total hardness, Alkalinity}

CH = min{150 mg/*l*, 120 mg/*l*}

CH = 120 mg/*l* as $CaCO_3$

NCH = TH – CH

NCH = (150 – 120) mg/*l* as $CaCO_3$

NCH = 30 mg/*l* as $CaCO_3$

12. (d)

Gastroenteritis is caused by Protozoa.

13. (c)

- Sedimentation tanks are designed for maximum daily demand.
- Particles having settling velocity greater than SOR will be completely removed i.e with 100% efficiency.

14. (d)

$$Q = 4 \times 10^6\ l$$

$$\text{Alum dosage} = 25\ \text{mg}/l$$

$$\text{Total alum added per day} = \frac{25 \times 4 \times 10^6}{10^6}\text{kg} = 100\ \text{kg}$$

We know that,

1 g of alum gives 0.234 g of $Al(OH)_3$.

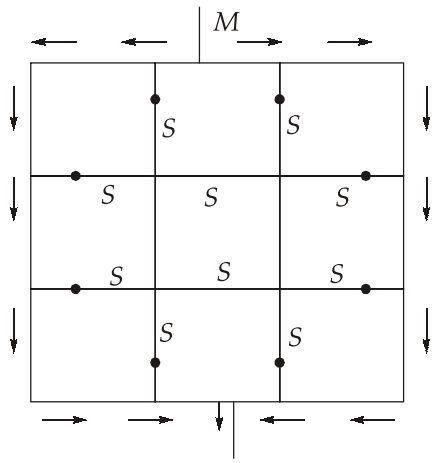
So, 100 kg of alum will give = 0.234×100

= 23.4 kg precipitate

17. (b)

Before break point all chlorine will be in combined form as all free chlorine will react with organic matter.

18. (c)



M : Main pipe
S : Sub mains
O : Cut off valves

19. (d)

Relative stability at 20°C

$$S_r = 100[1 - (0.794)^{t_{20}}]$$

$$= 100\ [1 - 0.5] = 50\%$$

Also if $t < 4$ days at 20° sample will be considered unstable.

20. (a)

Fresh water supplied to community = 150 × 40,000 = 6 MLD

Average daily discharge in sewer = 6 × 0.8 = 4.8 MLD

Maximum hourly discharge = 3 × Avg. daily discharge

= 3 × 4.8 = 14.4 MLD

21. (c)

Methane formers are very dedicated against shock loading as they do not respond quickly to the food given to them.

22. (a)

$$\text{Efficiency of filter} = \frac{y_i - y_t}{y_i} \times 100$$

$$= \frac{150 - 30}{150} = 80\%$$

$$\Rightarrow \quad \eta_f = \frac{100}{1 + 0.44\sqrt{\frac{Q_0 \cdot y_i}{V}}}$$

$$\Rightarrow \quad 80 = \frac{100}{1 + 0.44\sqrt{\frac{4000 \times 150 \times 10^{-3}}{v}}}$$

$$\Rightarrow \quad \sqrt{\frac{600}{V}} = \frac{0.25}{0.44}$$

$$\Rightarrow \quad V = 1858.56 \text{ m}^3$$

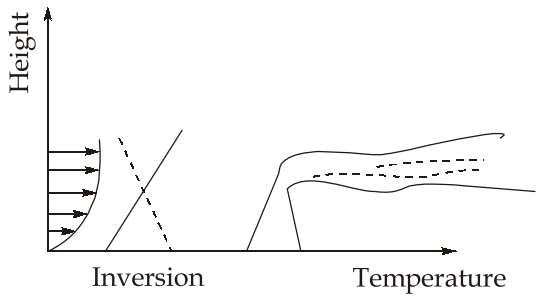
$$\Rightarrow \quad V = A \times d$$

$$\Rightarrow \quad A = \frac{1858.56}{4} = 464.64 \text{ m}^2$$

23. (c)

Nitrification in activated sludge process is aided by use of long aeration channels, high sludge age and low F/M ratio.

25. (c)



26. (d)

Height of hydraulically equivalent egg shaped sewer, (H) = $\frac{3}{2}D'$

Where $D' = 0.84D$

$$H = \frac{3}{2}(0.84D')$$

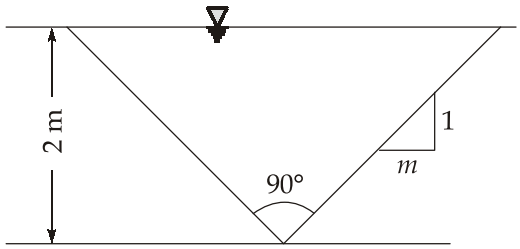
$$H = 756 \text{ mm}$$

27. (c)

$$C_D = \frac{0.074}{(\text{Re}_L)^{1/5}}$$

30. (c)

An efficient triangular ($\theta = 45°$) or $m = 1$



$$R = \frac{y}{2\sqrt{2}} = \frac{2}{2\sqrt{2}} = \frac{1}{\sqrt{2}} \text{ m}$$

31. (d)

For rectangular channel,

$$y_c^3 = \frac{q^2}{g} = \frac{2y_1^2y_2^2}{y_1 + y_2}$$

$$\frac{q^2}{g} = \frac{2\times(2)^2\times(3)^2}{2+3}$$

$$\frac{q^2}{g} = 14.4$$

$$q = \sqrt{14.4\times 10}$$

$$q \simeq 12 \text{ m}^3/\text{s/m}$$

32. (b)

For steep flow profile,

$y_c > y_n$

S1 : $y > y_c > y_n$

S2 : $y_c > y > y_n$

S3 : $y_c > y_n > y$

33. (c)

Reynolds number, $\text{Re} = \frac{V_r L_r}{\nu_r}$

$$\frac{V_r L_r}{\nu_r} = 1$$

Time ratio, $T_r = \frac{L_r}{V_r} = \frac{L_r}{\frac{\nu_r}{L_r}} = \frac{L_r^2}{\nu_r}$

38. (a)

$$\text{DRH} = \text{Flood hydrograph} - \text{base flow}$$

$$\text{Peak of unit hydrograph} = \frac{DRH}{\text{effective rainfall (in cm)}}$$

$$UH = \frac{10-4}{3} = 2\ \text{m}^3/\text{s}$$

39. (d)

Total rainfall during 4 hour storm = 3 + 2.8 + 4 + 2.5

$P = 12.3$ cm

Surface Runoff, $R = 2$ cm

$$\phi\text{-index} = \frac{P-R}{t_e} = \frac{12.3-2}{4} = \frac{10.3}{4} = 2.575\ \text{cm/hr}$$

As rainfall intensity ≤ ϕ-index, so

$$\phi\text{-index} = \frac{(3+2.8+4)-2}{3} = 2.6\ \text{cm/hr}$$

41. (c)

$$\text{Compactness coefficient} = \frac{P}{2\pi r_c}$$

Where, r_c (radius of equivalent circle) $= \sqrt{\frac{A}{\pi}}$

42. (c)

Linear reservoir is the one having a linear relationship between storage and output.

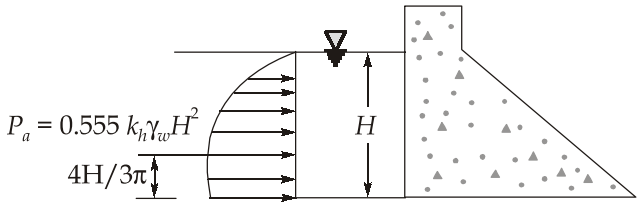
43. (b)

$$p = \frac{1}{10} = 0.1$$

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

$$= 1 - (1 - p)^n$$
$$= 1 - 0.9^5 = 0.41 \simeq 41\%$$

46. (c)



Hydrodynamic pressure distribution

where, P_a = Hydrodynamic pressure
k_h = Horizontal seismic coefficient

47. (d)

$$Q \propto \sqrt{S}$$

For same stage, $\frac{Q_2}{Q_1} = \sqrt{\frac{S_2}{S_1}}$

$$Q_2 = Q_1\sqrt{\frac{4000}{1000}} = 2Q_1$$

$$Q_2 = 2 \times 16\ m^3/s = 32\ m^3/s$$

49. (b)

$$\text{Sodium absorption ratio, SAR} = \frac{[Na^+]}{\sqrt{\frac{[Mg^{2+}]+[Ca^{2+}]}{2}}}$$

$$\text{SAR} = \frac{22}{\sqrt{\frac{3.6+4.4}{2}}} = \frac{22}{2}$$

$$\text{SAR} = 11$$

So, irrigation water can be classified as S_2, since 11 < SAR < 18.

50. (b)

Alkaline soils are reclaimed by the application of gypsum followed by the leaching process.

51. (b)

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

and $$D = \frac{A}{Q}$$

For rice, $$\frac{140}{100} = 8.64 \times \frac{140}{1000 / Q_{rice}}$$

$$\frac{1000}{Q_{rice}} = 864$$

$$Q_{rice} = \frac{1000}{864} = 1.15\,m^3/s$$

For wheat, $$\frac{50}{100} = 8.64 \times \frac{120}{2000 / Q_{wheat}}$$

$$\frac{2000}{Q_{wheat}} = \frac{8.64 \times 120}{0.5}$$

$$Q_{wheat} = 0.96\ m^3/s$$

$$\text{Design discharge} = \max.\begin{Bmatrix} Q_{rice} \\ Q_{wheat} \end{Bmatrix} = 1.15\ m^3/s$$

52. (b)

- Consumptive use refers to evaporation and transpiration from the cropped area.
- Garret's diagram is based on Kennedy's theory.

53. (b)

To represent three degrees of freedom of alluvial channel i.e. depth, width and gradient, three independent equations were proposed by Lacey.

54. (b)

$$d \geq 11\,RS$$

For wide rectangular channel, $R = y$

$$d_{min} = 11\,RS = 11 \times y \times S = 11 \times 2 \times \frac{1}{200} = 0.01\ m = 10\ mm$$

55. (a)

Technically, lustre is intensity of reflection of light from the mineral surface and depends at least on three factors:

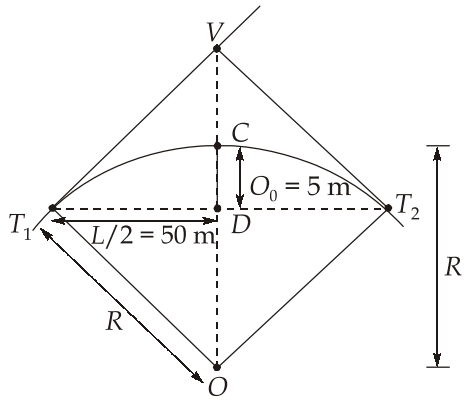
1. Refractive index of mineral.
2. Absorption (of light) capacity of mineral.
3. Nature of reflecting surface.

57. (d)

There are three types of igneous rocks:

1. Volcanic or extrusive rock – Spread over earth.
2. Hypabyssal rocks – Shallow depth
3. Plutonic or Intrusive rocks – Deep seated

58. (b)



From triangle OT_1D,

$$OT_1^2 = T_1D^2 + DO^2$$

$$R^2 = \left(\frac{L}{2}\right)^2 + (R - O_0)^2$$

$$O_0 = R - \sqrt{R^2 - (L/2)^2}$$

As per given data,

$$5 = R - \sqrt{R^2 - (50)^2}$$

$$R^2 - (50)^2 = R^2 + 5^2 - 10R$$

$$10R = 5^2 + 50^2$$

$$R = 252.5 \text{ m}$$

59. (d)

$$S = \frac{f}{H - h}$$

$$\frac{1}{16000} = \frac{f}{2200 - 200}$$

$$f = \frac{2000 \times 100}{16000} = 0.125 \text{ m}$$

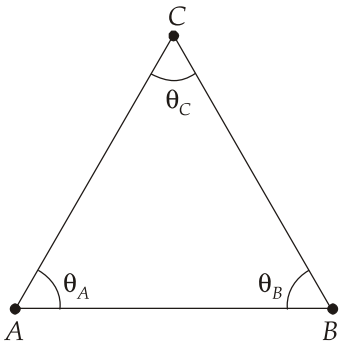
$$f = 12.5 \text{ cm}$$

60. (d)

- Wavelength shorter then 0.3 mm are completely absorbed by ozone layer in upper atmosphere.
- Wavelength of gamma ray $\rightarrow$ < 0.03 nm

  X-ray $\rightarrow$ 0.03 to 0.3 nm

61. (a)



AC = known side

C = number of geometric condition

= $(n' - s' + 1) + (n - 2s + 3)$

n = number of lines = 3

S = total number of station = 3

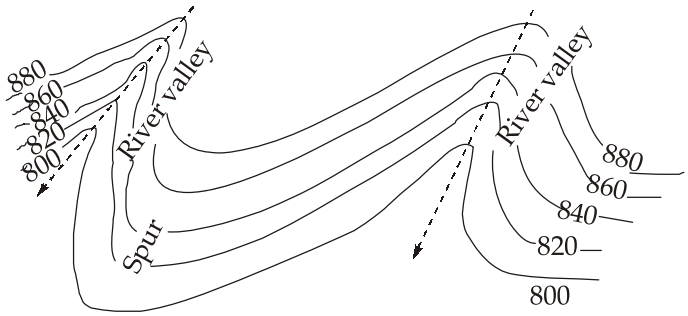
n' = number of lines observed in both direction = 3

S' = number of station occupied = 3

$C = [3 - 3 + 1][3 - 2(3) + 3]$

$C = 1$

63. (c)



64. (c)

- Anallactic lens is special convex external focusing lens fitted between the diaphragm and objective at a fixed distance from latter.
- The advantage of anallactic lens is that it reduces additive constant to zero and simplifies the computation of distance.

66. (c)

Given: $h = 900$ m

$$R_{earth} = \frac{12800}{2} = 6400 \text{ km}$$

If effect of refraction ignored, then

$$h = \frac{D^2}{2R}$$

$$900 = \frac{D^2}{2\times(6400\times1000)}$$

$$D = \sqrt{2\times900\times6400\times1000}$$

$$D = 30\times80\times10\times\sqrt{20}\times10^{-3}$$

$$D = 107.3312 \text{ km} \simeq 107.5 \text{ km}$$

67. (c)

The sensitivity of bubble tube can be increased by:

- Increasing internal radius of tube.
- Increasing the diameter of tube.
- Increasing the length of bubble.
- Decreasing roughness of wall of bubble tube.
- Decreasing viscosity of liquid.

68. (c)

- As per Bowditch rule, error in linear measurement is proportional to $\sqrt{l}$ and error in angular measured is inversely proportional to $\sqrt{l}$, where l is length of line.
- In Bowditch rule, linear and angular measurement are of equal precision.

69. (c)

$$\text{Least count} = \frac{S}{n}$$

Given: $S = \left(\frac{1}{4}\right)^\circ$

$$\text{Lease count} = 0.01^\circ$$

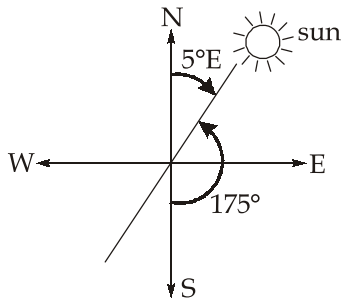
$\therefore$ $n = \frac{1/4}{0.01} = 25$

For direct vernier, $(n - 1)$ division i.e. 24 division of main scale, equal to n division i.e. 25 division of vernier scale.

70. (d)

Overall length of a chain at 8 kg pull and checked against a steel tape standarized at 20°C is 30 m ± 8 mm.

71. (d)



We know $FB - BB = 180°$

$FB = 180° + 175°$

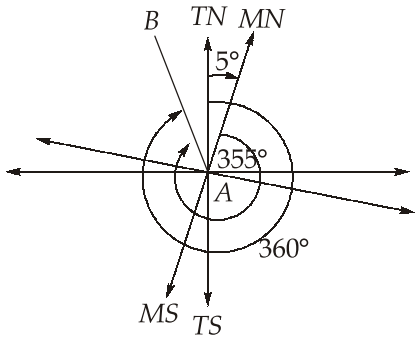
$FB_{AB} = 355°$

$\therefore$ Magnetic declination = 5°E

True fore bearing of line AB,

$\therefore$ True fore bearing = 355° + 5°

= 360° or 0°



72. (b)

- Dip is the vertical angle, which a freely suspended needle makes with horizontal plane.
- Survey is preferred with true meridian because they do not change with time.

73. (c)

- Circular summit curve is ideal as the sight distance available throughout length of circular curve is constant.
- As the deviation angle in vertical curve is very small and so between the same tangent points, a simple parabola nearly congruent with a circular arc.
- As parabola is easy for computation and provide good riding comfort too, so in actual practice a simple parabolic curve is used as summit curve.

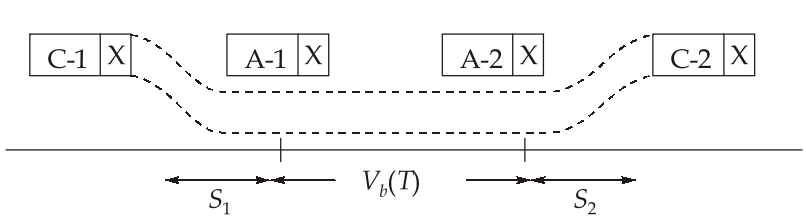
74. (b)

Right turn ahead is a warning sign.

75. (a)

Distance travelled by car during overtaking is

$d = S_1 + V_b(T) + S_2$ i.e. $d = V_b(T) + 2(S)$ $(\because S_1 = S_2)$



$$\therefore \quad d = \frac{36}{3.6}(6)+2(10)=80\,\text{m}$$

76. (d)

$$C = \frac{1000V}{S} = \frac{1000V}{0.3Vt+L_v}$$

$$C = \frac{1000\times 60}{(0.3\times 60\times 1)+6} = 2500 \text{ veh/hr/lane}$$

77. (c)

The various road patterns are:

1. Rectangular or block pattern.
2. Radial or star and block pattern.
3. Radial or star and circular pattern.
4. Radial or star and circular pattern.
5. Hexagonal pattern.
6. Minimum travel pattern.

78. (c)

$$e+f = \frac{V^2}{127R} \quad ; \quad f = 0 \text{ For equilibrium super elevation}$$

$$\therefore \quad e = \frac{V^2}{127R}$$

$$e = \frac{60\times 60}{127\times 600} = 0.0472 \text{ i.e } 4.72\%$$

79. (a)

$$\text{Braking length} = \frac{V^2}{2gf\eta_b}$$

$$50 = \frac{(72/3.6)^2}{2\times 10\times 0.4\times \eta_b}$$

$$\eta_b = 100\%$$

80. (a)

Value of possible capacity on road varies from zero to basic capacity.

81. (b)

As per Greenshield's model,

$$q_{\max} = \frac{U_{sf}K_j}{4}$$

$$3000 = \frac{120 \times K_j}{4}$$

$$K_j = 100 \text{ veh/km}$$

Now, at time of maximum flow, traffic density is $\frac{K_j}{2}$ i.e. 50 veh/km

$\therefore$ Spacing between vehicle is $= \frac{1000}{50} = 20\,\text{m}$

82. (b)

$$\text{Equivalent axle load factor} = \left(\frac{\text{Axle load}}{\text{Standard axle load}}\right)^4$$

$$= \left(\frac{120}{80}\right)^4 = 5.0625$$

83. (b)

$$k_1 a_1 = k_2 a_2$$

$$20 \times \left(\frac{30}{2}\right) = k_2 \times \left(\frac{75}{2}\right)$$

$$k_2 = 8 \text{ kg/cm}^3$$

85. (d)

Radius of relative stiffness, $l = \left[\frac{Eh^3}{12k\left(1-\mu^2\right)}\right]^{1/4}$

E = Modulus of elasticity of concrete = $5000\sqrt{f_{ck}}$

k = modulus of subgrade reaction = $\frac{P}{A\Delta}$ i.e. $\frac{\text{kg}}{\text{cm}^2 \times \text{cm}}$

μ = Poisson ratio of concrete

h = Slab thickness

87. (b)

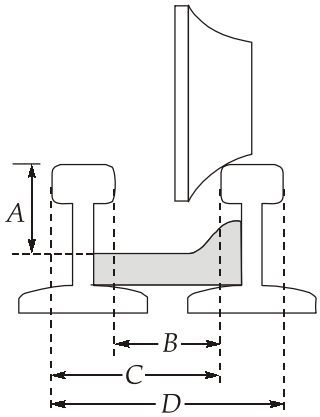
As, per railway board, $L_{TC} = 4.4\sqrt{R} = 4.4\sqrt{400} = 88$ m

88. (d)

Resistance due to BG curve = 0.0004 WD

= 0.0004 × 1000 × 2 = 0.8t

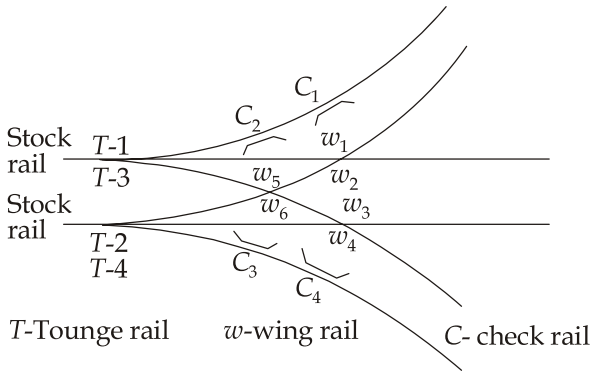
89. **(c)**



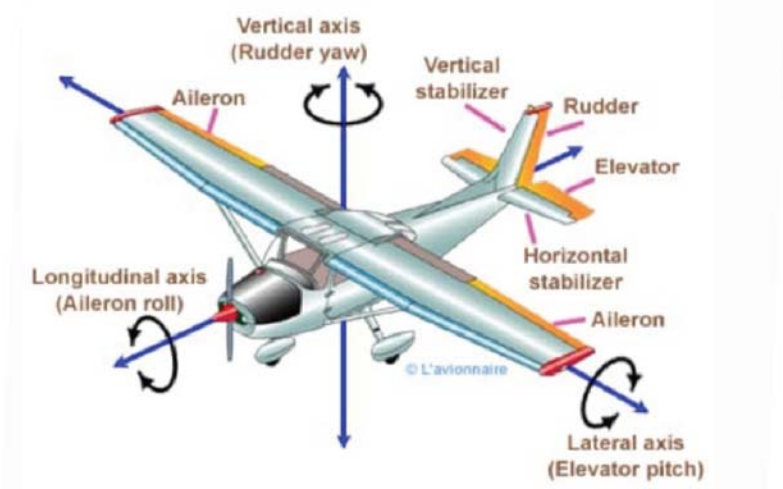
A - Flange way depth
B - Flange way clearance
C - Heel divergence
D - Heel divergence

90. **(c)**

Three throw switch contains 4 check rail only.



91. **(b)**



92. (c)

Standard atmospheric temperature = 15° – 0.0065(H)
= 15° – 0.0065(500)
= 11.75°C

Airport reference temperature = $T_a + \frac{T_m + T_a}{3}$

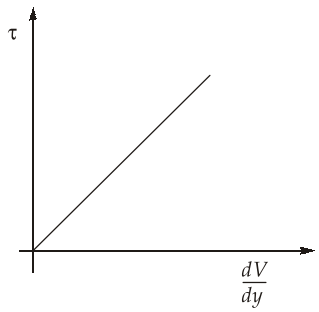
= $22 + \frac{31 - 22}{3}$ = 25°C

ΔT = $ART - SAT$ = 25 – 11.75 = 13.25°C

The basic length of runway corrected for elevation should further increase by 13.25%.

94. (b)

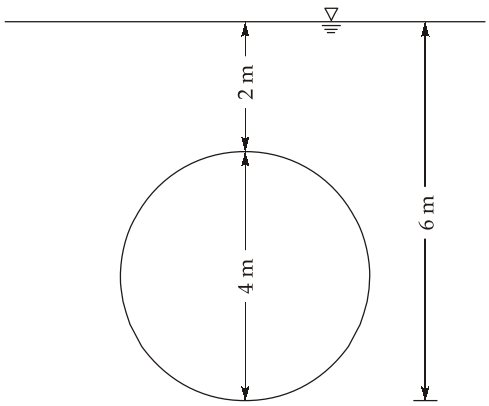
For Newtonian fluid, $\tau = \mu \frac{dV}{dy}$



95. (a)

$P_{abs} = (P_{atm})_{local} + P_g$
P_g = –50 kPa
$(P_{atm})_{local}$ = 100 kPa
P_{abs} = 100 – 50 = 50 kPa

96. (d)



$$h^* = \frac{I_G \sin^2\theta}{A\bar{h}} + \bar{h}$$

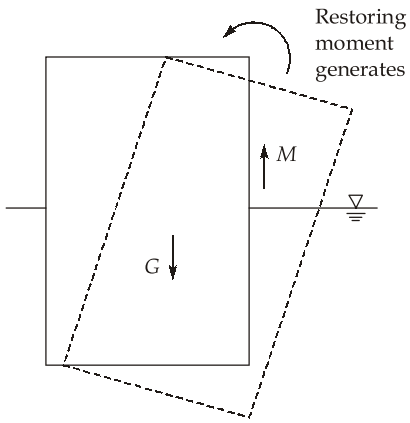
$$h^* = 2 + 2 = 4 \text{ m}$$

$$A = \frac{\pi}{4} \times 4^2 = 4\pi$$

$$I_G = \frac{\pi}{64} \times (4)^4 = 4\pi, \ \sin\theta = 1$$

$$h^* = \frac{4\pi \times (1)^2}{4\pi \times 4} + 4 = 4.25$$

97. (d)



98. (b)

$$\vec{V} = 2x\hat{i} - 2y\hat{j}$$

$$u = 2x, \ V = -2y$$

Equation of streamline,

$$\frac{dx}{u} = \frac{du}{v}$$

$$\frac{dx}{2x} = \frac{dy}{-2y}$$

$$\frac{dx}{x} = -\frac{dy}{y}$$

$$ydx = -xdy$$

$$xdy + ydx = 0$$

$$d(xy) = 0$$

$$xy = C$$

100. (b)

Reynold's No. $R_e = \frac{VD}{\nu} = \frac{1 \times 0.1}{0.5 \times 10^{-4}} = \frac{0.1 \times 10^4}{0..5} = 2000$

For $R_e = 2000$

$$f = \frac{64}{R_e} = \frac{64}{2000} = 0.032$$

101. (a)

- The northernmost range is called the Great Himalayas and is also the oldest of all the ranges of Himalayas.
- The Great Himalayan range is made up of erosion material from the rising Himalayas. Running parallel to this is the Lower Himalayan Range, which has an elevation between 2,000–5,000 m.

102. (d)

- Laterite soil is found in typical monsoon conditions such as high temperature and heavy rainfall with wet and dry periods.
- The alterations of the wet and dry season lead to the leaching away of siliceous matter and lime of the rocks and a soil rich in oxides of iron and aluminium compounds is left behind.

103. (a)

Rice is a Kharif crop that requires an average temperature of 25-degree centigrade and high humidity with an annual rainfall of above 100 cm. In areas with less rainfall, it grows with the help of irrigation.

105. (a)

The Aihole Inscription is found at Aihole in Karnataka state, India. It was written by the Ravikirti, court poet of Chalukya King, Pulakeshi II who reigned from 610 to 642 CE. The inscription is in the Sanskrit language, which uses the old Kannada script.

106. (d)

The 2022 Commonwealth Games, commonly known as Birmingham 2022, is an international multi-sport event for members of the Commonwealth that is scheduled to be held in Birmingham, England.

107. (d)

The Jaduguda Mine is a uranium mine in Jaduguda village in the Purbi Singhbhum district of the Indian state of Jharkhand. It commenced operation in 1967 and was the first uranium mine in India.

108. (a)

Vikramashila was one of the two most important centres of learning in India during the Pala dynasty, along with Nalanda. Its location is now the site of Antichak village, Bhagalpur district in Bihar. Vikramashila was established by the Pala emperor Dharmapala (783 to 820 AD).

109. (a)

Cash Reserve Ratio (CRR) is a specified minimum fraction of the total deposits of customers, which commercial banks have to hold as reserves either in cash or as deposits with the central bank (Reserve Bank of India).

111. (a)

The heavy metal cadmium (Cd) is known to be a widespread environmental contaminant and a potential toxin that may adversely affect human health.

112. (c)

- World-Wide Fund for Nature-India (WWF India) and the Confederation of Indian Industry (CII) have joined hands to develop a platform to promote a circular system for plastics. The new platform is called the 'India Plastic Pact,'.
- India generates 9.46 million tonnes of plastic waste annually, of which 40 per cent is not collected.
- About half of all plastics produced in the country are used in packaging, most of it is single-use in nature. The pact has time-bound targets for reducing, innovating and re-imagining plastic packaging.

113. (a)

- Ahmedabad-based Zydus Cadila has received emergency use authorization from the drug controller for its three-dose ZyCoV-D Covid-19 vaccine, the world's first plasmid DNA-based shot.
- The three-dose ZyCoV-D is India's sixth approved Covid shot after Covishield, Covaxin, Sputnik V, Moderna and Johnson and Johnson.

114. (b)

- Chief Justice of India N.V. Ramana launched a new scheme called 'FASTER' or 'Fast and Secure Transmission of Electronic Records'.
- Under the scheme, the Supreme Court will instantly transmit bail and other orders to the jail authorities, district courts and the High Courts. This will be done in a secure way electronically.

116. (b)

Article 338 of the Constitution of India mandates the Constitution of a National Commission for Scheduled Castes and Article 338A mandates the constitution of a National Commission for Scheduled Tribes.

119. (a)

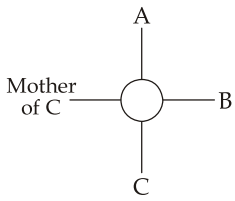
The Government of India created the Rural Infrastructure Development Fund (RIDF) under NABARD in 1995-96. The main objective of the Fund is to provide loans to State Governments and State-owned corporations to enable them to complete ongoing rural infrastructure projects.

120. (b)

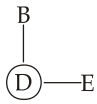
It was the Ashok Mehta Committee that recommended that there should be a minister for Panchayati Raj in the state council of ministers to look after the affairs of Panchayati Raj institutions.

121. (a)

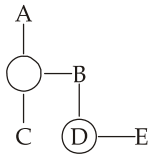
Step 1:



Step 2:



Merge:



A is grand parent of *E*. But gender of *A* and *E* cannot be decided.

122. (c)

Assume that two persons who can speak two languages speak hindi and gujarati

Number of persons who speak only hindi

$= 15 - 1 - 2 = 12$

Number of persons who speak only Gujarati

$= 6 - 1 - 2 = 3$

Number of persons who speak only Tamil

$= 6 - 1 = 5$

Total number of persons who can speak only one language

$= 12 + 3 + 5 = 20$

Total number of persons who speak two languages only = 2

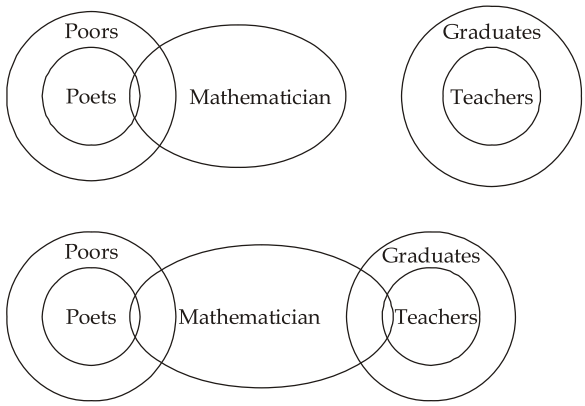
Total number of persons who speak two languages only = 1

Total number of persons in the bus

$= 20 + 2 + 1 = 23$

123. (b)

From the following diagram we can conclude that option (b) is not a valid conclusion as there is a possibility as seen in one of the venn diagram below that Some teachers are mathematicians.

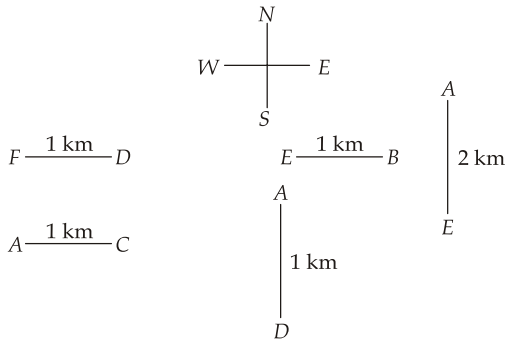


124. (c)

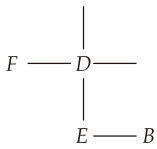
Note that 1 is coded as 'green' and 2 is coded as 'are'. Since '127' means 'lights are green'. Thus, 7 can be decoded as lights.

So, answer is (c).

125. (b)



Merge all:



So, *A*, *D* and *E* are in line.

■■■■