Full Length Test
Civil Engineering

Answer Keys and Explanations

1. **[Ans. A]**
Green's theorem and stokes theorem convert line integral to surface integral and vice versa. Whereas Gauss's Divergence theorem converts from surface to volume and vice versa.

2. **[Ans. A]**
$PQRS = I$
$P^{-1}\, PQRSS^{-1} = P^{-1}IS^{-1}$
$QR = P^{-1}S^{-1}$
$Q^{-1}QR = Q^{-1}P^{-1}S^{-1}$
$R = Q^{-1}P^{-1}S^{-1}$
$R^{-1} = (Q^{-1}P^{-1}S^{-1})^{-1}$
$= SPQ$

3. **[Ans. B]**
Consider $x = \sqrt{18}$
$x^2 = 18$
$f(x) = x^2 - 18 = 0$
$$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)}$$
$$x_1 = 4 - \left[\frac{(-2)}{8}\right] = 4.25$$
$$\therefore x_2 = 4.25 - \frac{(4.25)^2 - 18}{8.5} = 4.243$$

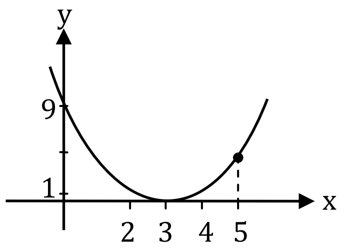
4. **[Ans. D]**
Given $(D^2 + 5D + 6) = \sin 2x, y_p = \frac{1}{D^2 + 5D + 6}\sin 2x, D^2 = -2^2 = -4$
$$= \frac{1}{-4 + 5D + 6}\sin 2x = \frac{1}{5D + 2}\sin 2x$$
$$= \frac{5D - 2}{25D^2 - 4}\sin 2x = \frac{5 \times D(\sin 2x) - 2\sin 2x}{25 \times -4 - 4}$$
$$= \frac{10\cos 2x - 2\sin 2x}{-104}$$

5. **[Ans. *] Range: 5 to 5**

$y = x^2 - 6x + 9 = (x-3)^2$

$y(2) = 1$

$y(5) = 4$



$\therefore$ Maximum value of y over the interval 2 to 5 will be at $x = 5$

6. **[Ans. C]**

Loss due to shrinkage = $\epsilon cs \times Es$

Loss due to creep = $\phi m f_c$ (from creep-co-efficient method)

7. **[Ans. C]**

Rebound hammer test is used to estimate hardness of casted concrete

Vicat's apparatus is used to check consistency of cement

Le-chatelier test is used to check soundness of cement

8. **[Ans. *] Range: 183 to 184**

Radius of Mohr's circle = τ_{max}

$$\tau_{max} = \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau_{xy}^2}$$

$$110 = \sqrt{\left(\frac{\sigma_y}{2}\right)^2 + (100)^2}$$

$\sigma_y = 91.6515$ MPa

$\sigma_x = 2 \times 91.6515$

$\sigma_x = 183.30$

9. **[Ans. *] Range: 157 to 158**

We know,

$$\frac{\sigma}{y} = \frac{E}{R}$$

$$\Rightarrow \sigma = \frac{E}{R}.y$$

$$= \frac{2.1 \times 10^5}{10 \times 10^3} \times \frac{15}{2} = 157.5\ \text{N/m}^2$$

10. **[Ans. *] Range: 9 to 9**
For limit state of serviceability
Design load = 1.0 (L.L +D.L)
For limit state of collapse, design load = 1.5 (L.L+D.L)
Here, 1.0 (LL+DL) = 9 kN/m^2

11. **[Ans. *] Range: 230.76 to 230.76**
As per IS 456:2000, the span/ effective depth ≤ 26 times for
Continuous beams
$\therefore$ Effective depth $\geq \frac{6000}{26} \geq 230.76$ mm

12. **[Ans. B]**
Static Indeterminacy = m + r − 2j
$= 12 + 3 - 2 \times 8$
$\Rightarrow -1$
Kinematic Indeterminacy = 2j − r
$= 2 \times 8 - 3$
$\Rightarrow 13$

13. **[Ans. A]**

14. **[Ans. D]**

15. **[Ans. D]**

16. **[Ans. D]**
Vibro– piles are used when ground is soft and offer little resistance to flow of concrete
Vibro – expanded piles are those piles which have enlarged bulb beyond certain depth and are used when bearing capacity of soil is low and hence it is unable to offer desired driving resistance

17. **[Ans. D]**
In control section given all holds. As per Bernoulli's equation, energy is conserved. As per continuity, mass or discharge is conserved. As per impulse, momentum is conserved

18. **[Ans. C]**
The soap bubble has two interfaces.
Work done = Surface tension × Total surface area
$= 0.05 \times 4\pi \left(\frac{15}{2} \times 10^{-12}\right)^2 \times 2$
$= 70.68 \times 10^{-4}$ Nm

19. **[Ans. D]**

20. **[Ans. A]**

Salt concentration in mg/L or ppm = 640 × EC in millimho/cm

$\therefore \text{EC} = \frac{3000}{640} = 4.69$ millimho/cm

21. **[Ans. A]**

Sludge digestion, septic tank, imhoff tank, anaerobic lagoons are anaerobic biological units

22. **[Ans. *] Range: 400 to 400**

BOD = (Δ D. O.) × dilution factor

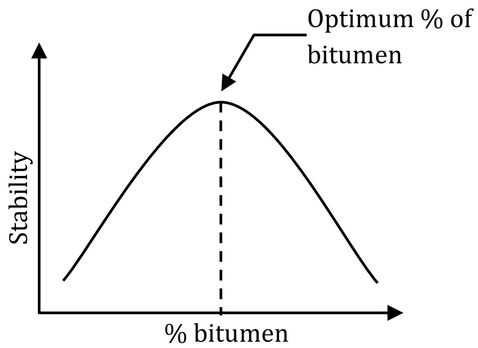
$\text{Dilution factor} = \frac{\text{Volume of diluted sample}}{\text{Volume of undiluted sewage sample}}$

$\therefore \text{BOD} = 8 \times 50 = 400$ mg/l

[∵2 % dilution means 2 gm of sewage sample in 100 gm of total volume]

23. **[Ans. C]**

Variation is as shown below



24. **[Ans. B]**

Test	**Property**
(A) Crushing test	Strength
(B) Abrasion tests	Hardness
(C) Impact test	Toughness
(D) Soundness test	Durability

25. **[Ans. *] Range 0.00125 to 0.00125**

$$S = \frac{nl}{R} = \frac{1 \times 10^{-3}}{0.8} = \frac{1}{800} = 0.00125$$

26. **[Ans. D]**

Given that a > 0

So, $I_o\ a^{f(x)} > 0$

And also $g(x) > \frac{1}{2}$

So $a^{f(x)} + g(x) > \frac{1}{2}$ for all x∊R,

$\therefore a^{f(x)} + g(x) = 0$ Has no solution

27. **[Ans. B]**

$$SSD = 0.278\ Vt + \frac{V^2}{254[f - n\%]}$$

$$SSD = [0.278 \times 80 \times 2.5] + \frac{80^2}{254[0.35 - 0.03]}$$

$$SSD = 134.34\ m \approx 134.5\ m$$

28. **[Ans. D]**

$x^2 - x + I = 0$, Multiplying both sides by x^{-1}

$x - I + x^{-1} = 0$

$$\therefore x^{-1} = I - x = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} - \begin{bmatrix} b^2 & 1 \\ (b^2 + b - 1) & (1 - b) \end{bmatrix} = \begin{bmatrix} (1 - b^2) & -1 \\ (1 - b - b^2) & b \end{bmatrix}$$

29. **[Ans. *] Range: 29.5 to 29.5**

Since

$$k = \frac{\gamma_w}{\eta} \times \frac{e^3}{1+e} \times CD_s^2$$

for l, C, D_s Being constant

$$k = A \times \frac{\gamma_w}{\eta}$$

$$\Rightarrow k = A \times \frac{\gamma_{w_1}}{\eta_1}$$

$$\Rightarrow \frac{k_1}{k} = \frac{\gamma_{w_1} \times \eta}{\eta_1 \times \gamma_w}$$

$$\Rightarrow k_1 = k \frac{\gamma_{w_1}}{\gamma_w} \times \frac{\eta}{\eta_1}$$

now $\gamma_{w_1} = 0.97\ \gamma_w$

$\eta_1 = 0.75\ \eta$

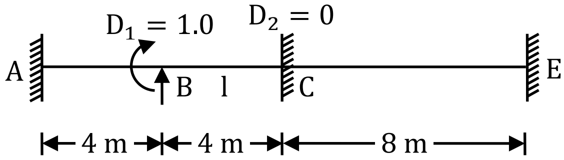
$\Rightarrow k = 1.2933\ k \qquad \Rightarrow \Delta k = 29.5\ \%$

30. **[Ans. A]**

Loading in CD form a couple (equal and opposite force) and hence shear force just to left of C becomes zero. Bending moment is constant since couple has a constant value.

31. **[Ans. D]**

Stiffness matrix can be obtained by making second co-ordinate i.e. rotation in the direction of 2 as zero and considering unit rotation in the direction of 2 as zero and considering unit rotation in the direction of co-ordinate 1.



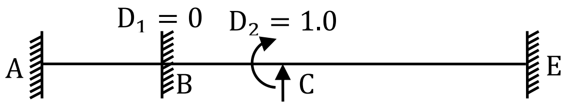
The beam AB has rotational stiffness

$\frac{4E(2l)}{4} = 2El$ and beam BC has rotational

Stiffness $\frac{4E(l)}{4} = El$.

So moment required in the direction of 1 to produce unit rotation will be $2El + El = 3El$. Thus $K_{11} = 3El$.

The moment generated at point C in the direction of co-ordinate 2 is $^1/_2 \times El = 0.5\ El$ as the carry over factor is half. So, $K_{21} = 0.5\ El$. Similarly make $D_1 = 0$ and $D_2 = 1.0$



$K_{22} = \frac{4El}{4} + \frac{4E(2l)}{8} = 2El$

$K_{12} = 0.5\ EI$

Stiffness matrix $= \begin{bmatrix} K_{11} & K_{12} \\ K_{21} & K_{22} \end{bmatrix}$

$= \begin{bmatrix} 3El & 0.5El \\ 0.5El & 2El \end{bmatrix}$

32. **[Ans. C]**

From Castigliano's-I

$$\delta_c = \frac{\partial U}{\partial W} = \frac{1}{E}\int \frac{M_x}{I_x}\frac{\partial M_x}{\partial W}\,d_x$$

$$I_x = I + \frac{I}{2}.\frac{2}{L}.x = I\left(1+\frac{x}{L}\right); \text{For } x = (0 \text{ to } L/2)$$

$$M_x = \frac{W}{2}.x, \frac{\partial M_x}{\partial W} = \frac{x}{2}$$

$$\therefore \delta_c = 2\int_0^{L/2} \frac{\left(\frac{Wx}{2}\right)\left(\frac{x}{2}\right)dx}{\frac{EI}{L}(x+L)} = \frac{WL}{2EI}\int_0^{L/2}\frac{x^2dx}{(x+L)} \quad \ldots.[\text{Put } x+L = t \text{ and integrate}]$$

$$= \frac{WL}{2EL}\int_L^{3L/2}\frac{(t-t)^2}{t}dt$$

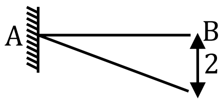
$$= \frac{WL}{2EI}\left[\frac{5L^2}{8} + L^2\ln\left(\frac{3}{2}\right) - 2L\times\frac{L}{2}\right]$$

$$= \frac{WL^3}{2EI}\left[\frac{5}{8} - 1 + \ln\frac{3}{2}\right]$$

$$\therefore \delta_c = 0.015\frac{WL^3}{EI}$$

33. **[Ans. *] Range: 50 to 50**

For maximum bending moment at A, load should be placed in such a way that 20 kN lies at B and 10 kN at mid-point of A and B. This is established from influence line diagram of moment at B by giving unit rotation at B. Since, an internal hinge is present at B, ILD for Bending moment at A will be like this.



Thus, BM max=20x2+10x1= 50 kN-m

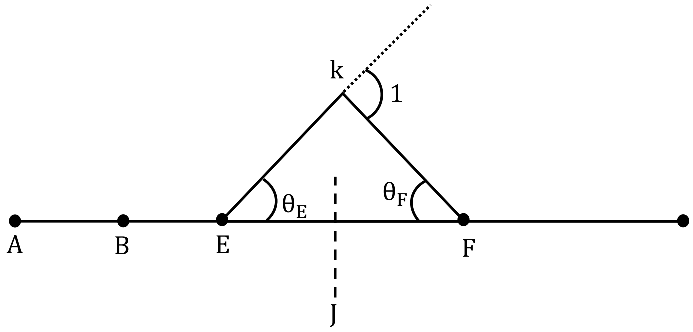
34. **[Ans. D]**

External work done = Load × deflectin = $w_u \times L \times \theta$

$w_u L\theta = M_P\theta = PL\theta$

$\Rightarrow w_u = P$

35. **[Ans. *] Range: 2343.7 to 2343.8**
Using Muller-Breslau principle I.L. for M_J is obtained by compatibility of rotaions/ translations at joints justified
IL for M_J



$\Rightarrow \theta_E + \theta_F = 1 \quad [\because \text{of Muller} - \text{Breslaus principle}]$
$KJ = EJ\tan\theta_E = JF\tan\theta_F$
$\Rightarrow \theta_E = \theta_F [\because EJ = JF]$
$\therefore \theta_E = \theta_F = \frac{1}{2}$
$\therefore KJ = \frac{1}{2} \times EJ = \frac{25}{4}$
$\therefore$ span of load should be E F and B. $M_{max}(J) = (30 \times 25) \times \frac{1}{2}\left(\frac{25}{4}\right) = 2343.75$ kNm
[i. e. total load $\times$ area of I. L. D]

36. **[Ans. *] Range: 56 to 56**
$\Delta l_s + \Delta l_a = \text{gap}$
$l_s\alpha_s\Delta T + l_a\alpha_a\Delta T = \text{gap}$
$[0.5(12 \times 10^{-6}) + 0.499 \times 24 \times 10^{-6}]\Delta T = 0.001$
$17.976 \times 10^{-6}\Delta T = 0.001$
$\Delta T = 55.629$
$= 56°C$

37. **[Ans. A]**
$W_w = 1.15 - 0.5 = 0.65$ N
$w = \frac{0.65}{0.50} = 130\%$
$V = \pi \times \frac{38^2}{4} \times 76 = 86.2 \times 10^3 mm^3$
$V_s = \frac{\text{weight}}{\text{specific gravity} \times \text{density of water}} = \frac{0.5}{2.7 \times 10^{-5}} = 18.5 \times 10^3 mm^3$
$V_v = V - V_s = 67.7 \times 10^3 mm^3$
$V_w = w \times W_s \div \gamma_w$
$= 1.30 \times 0.5 \div 10.00 \text{ kN/m}^3 = 65 \times 10^3 mm^3$
$\therefore S = \frac{V_w}{V_v} = 96\%$

38. **[Ans. *] Range: 1.4 to 1.5**

$$F = \frac{c}{\gamma_{sat}\, Z \cos i \sin i} + \frac{\gamma'}{\gamma_{sat}} \frac{\cos i \tan \phi}{\sin i}$$

$$F = \frac{8}{19 \times 5\ \cos 12° \sin 12°} + \frac{(19-10)}{19} \times \frac{\tan 22°}{\tan 12°}$$

$$= 0.414 + 1.000\ = 1.414$$

39. **[Ans. B]**

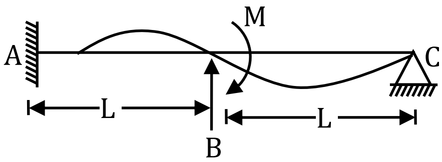
Here, $m = n = 5$

$$\theta = \tan^{-1}\left(\frac{0.045}{1.5}\right) = 1.71°$$

$$\therefore n_g = 1 - \frac{1.71}{90}\left[\frac{4 \times 5 + 4 \times 5}{25}\right]$$

$$= 0.9696 \times 100 = 96.96\%$$

40. **[Ans. D]**



Apply slope deflection equation:

$\theta_A = 0, \theta_B = 1.$

$M_{FBA} = M_{FBC} = M_{FCB} = 0$

Span AB ; $M_{BA} = M_{FBA} + \frac{2EI}{L}(2\theta_B + \theta_A)$

$$= 0 + \frac{2EI}{L}(2 \text{ x } 1 + 0)$$

$$= 4EI/L$$

Span BC: (C is hinged)

$$M_{BC} = M_{FBC} - \frac{M_{FCB}}{2} + \frac{3EI}{L}(1) = 0 - 0 + \frac{3EI}{L} = \frac{3EI}{L}$$

$\therefore$ Required moment, $M = \frac{4EI}{L} + \frac{3EI}{L} = \frac{7EI}{L}$

41. **[Ans. B]**

Volume applied $= 600\ m^3$

Wasted $= 60\ m^3$

$\therefore$ Water used $= 540\ m^3$

Area irrigated $= 1000\ m^3$

$\therefore$ Depth of water used in raising m.c. upto field capacity $= \frac{540}{1000} = 0.54$ m

$$d_\omega = \frac{r_d \times d}{r_\omega}[\text{F.C.} - \text{lower m.c.}]$$

$$\Rightarrow 0.54 = \frac{1450 \times 2}{1000}[\text{F.C.} - 0.08]$$

$\therefore FC = 0.27$

$FC = 0.27 \times 100 = 27\%$

42. **[Ans. *] Range 1.8 to 2.2**

$Q = AV = \text{constant}$

$V_{nozzle} = \dfrac{AV}{A_{nozzle}}$

$= \dfrac{D^2}{d^2} v$

$= \left(\dfrac{8}{2}\right)^2 \times 0.25$

$V_{nozzle} = 4 \text{ m/s}$

$R = vt \ldots\ldots\ldots (1)$

But, $h = \dfrac{1}{2} g t^2$

$t^2 = \dfrac{2h}{g}$

$t = \sqrt{\dfrac{2h}{g}}$

Apply t and v value in equation (1)

$R = 4 \times \sqrt{\dfrac{2 \times 1.25}{10}}$

$R = 2 \text{ m}$

43. **[Ans. *] Range: 5.2 to 5.2**

For ISI Pan, average Pan co-efficient, $C_P = 0.70$

Lake evaporation (mm/day) $= C_P \times$ Pan evaporation(mm/day)

$= 0.7 \times 77 (\text{mm/week})$

$= 0.7 \times \dfrac{77}{7} = 7.7 \text{ mm/day}$

From Meyer's formula,

Lake evaporation, $E_L = k_m (e_w - e_a)\left(1 + \dfrac{u_9}{16}\right)$

Where, $e_w = 16.42$ mm Hg

$e_a = e_w \times$ Relative humidity $= 6.568$ mm Hg

$u_9 = (9)^{\frac{1}{7}} \times u_1 = (9)^{\frac{1}{7}} \times 15 = 20.53$ kmph

$k_m = 0.36$

So, $E_L = 0.36(16.42 - 6.568)\left(1 + \dfrac{20.53}{16}\right) = 8.098 \text{ mm/day} \approx 8.1 \text{ mm/day}$

Then, percentage difference $= \dfrac{8.1 - 7.7}{7.7} \times 100 \approx 5.2\%$

44. **[Ans. B]**

Due to loss of water by evaporation and percolation, the duty is less at the head of distributary than at the head of the water course and more than that at the head of the canal.

45. **[Ans. B]**

Governing equation is, Viscous force on the element = force of gravity on the element

$$\mu \frac{d^2u}{dy^2} = \rho g$$

$$\text{Or, } \mu \frac{du}{dy} = \rho g y + C_1$$

$$\text{Or, } \frac{du}{dy} = \frac{\rho g y}{\mu} + \frac{C_1}{\mu}$$

$$u = \frac{\rho g y^2}{2\mu} + \frac{C_1}{\mu} y + C_2$$

At $y = 0$

$u = U_0$

So, $C_2 = U_0$

At $y = h$

$\tau = 0$

$$\text{So } \frac{du}{dy} = 0$$

And $C_1 = -\rho g h$

$$u = \frac{\rho g y^2}{2\mu} - \frac{\rho g h y}{\mu} + U_0 = \frac{\rho g}{\mu}\left(\frac{y^2}{2} - hy\right) U_0$$

46. **[Ans. *] Range: 0.02 to 0.03**

For removal

$$\frac{v}{v_s} = \frac{L}{H}$$

$$\therefore v_s = 1.22 \times \frac{3.5}{75} = 0.0567 \text{cm/s}$$

As per stokes law

$$v_s = \frac{1}{18\nu} \times d^2 (G_s - 1) \times g$$

$$\Rightarrow 0.0567 = \frac{981}{0.01 \times 18} \times d^2 (2.65 - 1) \qquad [g = 981 \text{ cm/s}^2]$$

$$\Rightarrow d = \sqrt{\frac{0.0567 \times 0.01 \times 18}{981 \times 1.65}}$$

$$d = 0.025 \text{ mm}$$

47. **[Ans. B]**

Since, air is fully saturated with water vapour, we shall use wet adiabatic lapse rate which is given as 6°C/km.

$$\text{Lapse rate for existing condition } = \frac{5°C - 25°C}{1030 - 30} = -20°C/km$$

Which is greater than adiabatic lapse rate, thus, super–adiabatic conditions are prevalent further, no indication of inversion is given in data, therefore looping plume is correct answer

48. **[Ans. D]**

$$\frac{\text{Per capita demand}}{\text{day}} = \left(\frac{2,00,000}{30,000}\right)^{-1} = 0.15\ \text{m}^3/\text{day}/\text{person}$$

Population after 20 years $= 1.5 \times 2,00,000$

$= 3,00,000$

$\therefore$ Rate of growth $= \frac{1,00,000}{20} = 5000$ Persons /year

By method of arithmatic progression

$(0.15)[2,00,000 + 5000 \times x] = 38000 \Rightarrow \text{So}, X = 10.67$ years

49. **[Ans. *] Range: 52.5 to 53**

4% dilution means 4 parts of original sample mixed with 96 ml of aerated water.

$\therefore$ Initial dissolved oxygen in diluted sample $= \frac{4 \times 0.6 + 96 \times 3}{4 + 96} = 2.904\ \text{mg/L}$

$\therefore$ Initial D. O. $= 2.904$mg/L

Final D.O. $= 0.8$ mg/L

$\text{B. O. D}_5 = (\text{Final D. O.} - \text{Initial D. O.}) \times \text{Dilution factor}$

$$= (2.904 - 0.8) \times \frac{100}{4} = 52.6\ \text{mg/L}$$

50. **[Ans. B]**

$V = 50$ kmph; $t = 0.75$ secs; $L = 6.1$ m

$S_g = 0.278\ Vt$

$S_g = 0.278 \times 50 \times 0.75 = 10.425$ m

Theoretical capacity $= \frac{1000\ V}{S}$

$$C = \frac{1000\ V}{S_g + L}$$

$$C = \frac{1000 \times 50}{10.425 + 6.1}$$

$C = 3026$

51. **[Ans. B]**

Deviation angle, $N = \frac{1}{25} + \frac{1}{40} = 0.065$

Assuming $L > S$, where S is headlight sight distance,

$$L = \frac{NS^2}{(1.5 + 0.035S)}$$

$$= \frac{0.065 \times 100^2}{1.5 + 0.035 \times 100}$$

$= 130$ m

52. **[Ans. C]**

Rate of change of momentum = force acting on body

$\Rightarrow \dfrac{\partial}{\partial t}[m(0-v) = w \times f$

$\Rightarrow m\dfrac{\partial}{\partial t}(v) = w \times f$

$\Rightarrow \dfrac{W}{g}\dfrac{\partial}{\partial t}(v) = w \times f$

$\dfrac{\partial u}{\partial t} = g \times f$

$\therefore \dfrac{\partial u}{\partial t} = g \times 0.22 = 9.81 \times 0.22 = 2.15\ m/s^2$

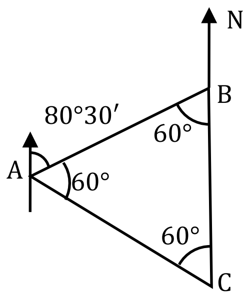
53. **[Ans. B]**

In moving observer method,

Average velocity, $V_a = \dfrac{l}{tw - \frac{m_w}{q}} \ldots \ldots ..$ ①

$\therefore V_a = \dfrac{400m}{5 - \frac{10}{10}} = 100\ ms^{-1}$

54. **[Ans. *] Range: 320 to 321**



FB of AB = 80°30′

FB of BC = BB of AB − ∠B

$= (80°30' + 180°) - 60° = 200°30'$

FB of CA = BB of BC −∠C(exterior)

$= (200°30' - 180°) + (360° - 60°)$

$= 320°30'$

$= 320.5°$

55. **[Ans. B]**

56. **[Ans. D]**

They will chime together after the time in minutes equal to LCM of 18, 24, 32.

$18 = 2 \times 3 \times 3$

$24 = 2 \times 2 \times 2 \times 3$

$32 = 2 \times 2 \times 2 \times 2 \times 2$

$\therefore$ LCM $= 2 \times 2 \times 2 \times 3 \times 3 \times 2 \times 2 = 288$

288 min = 4 hrs 48 min.

57. **[Ans. C]**
According to the statement, 80% of the total runs were made by spinners. So, conclusion I does not follow. Nothing about the opening batsmen is mentioned in the statement. So, conclusion II also does not follow

58. **[Ans. D]**
1 km = 1000 meter
1 min = 60 second

$$\text{Average speed } = \frac{\text{Total distance}}{\text{Total time}}$$

Total distance = 12 km = 12000 meter
Total time = 6 + 6 +12 minute = 24 × 60 = 1440 seconds

$$\text{Average speed } = \frac{12000}{1440} = 8.33\text{ m/s}$$

59. **[Ans. A]**

60. **[Ans. C]**
CEPQS - E cannot go with S.
AEPQS - C and P have to be together. E cannot go with S.
ACPRS -It satisfies all the conditions and also there are two boys in the team.
BDPRS - C and P have to be together.
Hence, C

61. **[Ans. A]**

$$\text{Number of males in U.P } = \left[\frac{3}{5}\text{ of }(15\%\text{ of N})\right] = \frac{3}{5}\times\frac{15}{100}\times \text{N} = \frac{9\text{N}}{100}$$

$$\text{Total population, N } = 3276000$$

$$\text{Number of males in M.P } = \left[\frac{3}{4}\text{ of }(20\%\text{ of N})\right] = \frac{3}{4}\times\frac{20}{100}\times \text{N} = \frac{15\text{N}}{100}$$

$$\text{Number of males in Goa } \left[\frac{3}{8}\text{ of }(12\%\text{ of N})\right] = \frac{3}{8}\times\frac{12}{100}\times \text{N} = \frac{4.5\text{N}}{100}$$

$$\text{Total males in these 3 states } = \frac{(9+15+4.5)\text{N}}{100} = \frac{28.5\text{N}}{100}$$

$$\text{Required \% } = \left(\frac{28.5\times\frac{\text{N}}{100}\times 100}{\text{N}}\right)\% = 28.5\%$$

62. **[Ans. C]**

A cube is cut into 125 smaller cubes.

$\therefore$ Length of cube $= \sqrt[3]{125}$

$\therefore$ l = 5 unit

Let upper face be coloured red.

Then bottom face will be coloured green, two adjacent faces are coloured yellow and blue respectively.

Two faces are uncoloured.

Number of cubes uncoloured on all faces $= (n-2)^3 = (5-2)^3 = 27$

Now there are two surfaces which are not coloured.

$\therefore$ There will be 9 cubes at centre on both the uncoloured surfaces each.

3 cubes at the common edge of both uncoloured surfaces.

$\therefore$ Total number of uncoloured cubes $= 27 + 9 + 9 + 3 = 48$

63. **[Ans. C]**

64. **[Ans. B]**

The passage clearly states the unawareness of teachers regarding population education. Thus, the teachers should be given a proper orientation on the same.

65. **[Ans. C]**

In statement I nothing is given about c. Hence it is not enough to answer the question.

In statement II nothing is mentioned about a. Hence this statement alone cannot answer the question.

Combining both the statements we get

a : b : c = 3 : 15 : 10

$\therefore$ a : c = 3 :10

$$\frac{a}{c} = \frac{3}{10}$$

$$\frac{a+c}{c} = \frac{3+10}{10} = \frac{13}{10}$$

$\therefore$ Question can be answered using both the statements.

Hence, C.