GATE Architecture and Planning

Sample Paper – 6

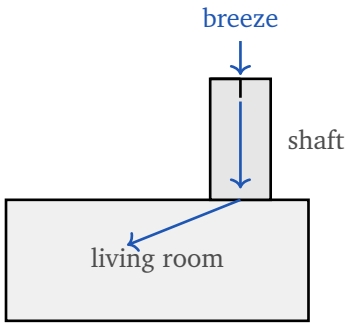
Duration: 128 Minutes **Maximum Marks: 72**

Instructions

- This paper contains **46 questions** covering the core **Architecture and Planning (AR)** subject of the GATE paper conducted by the IITs and IISc (General Aptitude and Engineering Mathematics are provided as separate papers).
- **Q1–Q20 carry 1 mark each** and **Q21–Q46 carry 2 marks each**, for a total of **72 marks**.
- Each question carries **negative marking of one-third of its allotted marks**: a wrong 1-mark question costs **0.33** and a wrong 2-mark question costs **0.67**. Unattempted questions carry no penalty.
- Every question here is a single-correct **MCQ**. The real GATE paper also has Multiple Select (MSQ) and Numerical Answer Type (NAT) questions, and **those carry no negative marking**.
- Attempt this paper in one timed sitting of about **128 minutes**, the share this core subject earns at GATE's overall pace of 180 minutes for 65 questions. Use standard code values (IS codes, NBC) and $g = 9.81$ m/s^2 unless stated otherwise.

Architecture, Design and History of Architecture

Q1. In the vernacular architecture of hot-arid regions such as western Rajasthan and West Asia, a tall shaft rising above the roof, open at the top to catch the breeze and channel cool air down into the living space below (as sketched in section), is traditionally called a: **[1 mark]**



(A) Badgir (wind tower)

(B) Jaali screen

(C) Chhajja

(D) Chabutara

Q2. The Lotus Temple (Bahá'ı House of Worship) in New Delhi, with its twenty-seven free-standing marble-clad "petals" arranged in clusters of three to form a nine-sided flower, was designed by the architect: **[1 mark]**

(A) Charles Correa

(B) Fariborz Sahba

(C) Balkrishna Doshi

(D) Louis Kahn

Q3. In South Indian (Dravidian) temple architecture, the monumental, pyramidal, richly ornamented gateway tower built over the entrance in the enclosing wall of the temple complex is called the: **[1 mark]**

(A) Shikhara

(B) Vimana

(C) Mandapa

(D) Gopuram

Q4. In the warm-humid climate of Kerala, the traditional *Nalukettu* house is organised around a central open-to-sky courtyard that admits light and promotes ventilation. This central courtyard is called the: **[1 mark]**

(A) Nadumuttam

(B) Deori

(C) Haveli

(D) Wada

Q5. Works such as the Sangath studio and the Aranya low-cost housing at Indore, noted for their climate response and use of local materials, are associated with the Indian architect and 2018 Pritzker laureate: [1 mark]

(A) Charles Correa

(B) Raj Rewal

(C) Balkrishna Doshi

(D) Achyut Kanvinde

Q6. Charles Correa's low-income "Tube House" at Ahmedabad used a narrow section with a sloping roof and high vents to drive stack-effect ventilation, an approach he summed up in the design maxim: [1 mark]

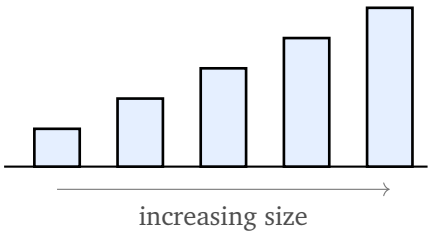
(A) "form follows climate"

(B) "form follows finance"

(C) "less is more"

(D) "ornament is crime"

Q7. The ordering principle of composition in which a series of similar elements change in a regular, stepwise manner – for example window openings that grow progressively larger along a facade, as sketched – is called: [1 mark]



(A) Rigid symmetry

(B) Radial balance

(C) Gradation

(D) Random contrast

Q8. The ancient Indian *Shilpa Shastra* treatise that codifies canons of proportion, orientation and construction for temples, buildings and towns, and is a principal source of Vastu principles, is the: **[1 mark]**

(A) Arthashastra

(B) Charaka Samhita

(C) Manasara

(D) Natyashastra

Building Construction, Materials and Management

Q9. The brick masonry bond in which *each* course shows alternate headers and stretchers, with every header centred over the stretcher in the course below, giving a strong and pleasing appearance, is called: **[1 mark]**

(A) Stretcher bond

(B) Header bond

(C) Stack bond

(D) Flemish bond

Q10. The commonly adopted nominal (co-ordinating) size of a hollow/solid concrete masonry block used for wall construction in India, inclusive of the standard 10 mm mortar joint, is: **[1 mark]**

(A) 200 mm $\times$ 100 mm $\times$ 100 mm

(B) 300 mm $\times$ 200 mm $\times$ 150 mm

(C) 400 mm $\times$ 200 mm $\times$ 200 mm

(D) 500 mm $\times$ 250 mm $\times$ 250 mm

Q11. In the PERT technique, the expected duration of an activity is $t_e = \frac{t_o + 4t_m + t_p}{6}$, where t_o, t_m and t_p are the optimistic, most-likely and pessimistic times. For $t_o = 4$ days, $t_m = 7$ days and $t_p = 16$ days, the expected duration is: **[1 mark]**

(A) 9 days

(B) 7 days

(C) 6.5 days

(D) 8 days

Q12. As per IS specifications, the maximum water absorption of a good *first-class* building brick, when immersed in cold water for 24 hours, should not exceed about: **[1 mark]**

(A) 20% of its dry weight

(B) 5% of its dry weight

(C) 40% of its dry weight

(D) 60% of its dry weight

Q13. In brick masonry, a brick that has been cut lengthwise so that its width is reduced to half, and which is used to close the bond at the end of a course, is called a: **[1 mark]**

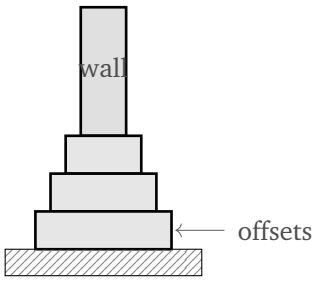
(A) Queen closer

(B) King closer

(C) Bat

(D) Bevelled closer

Q14. A load-bearing masonry wall whose base is widened in a series of stepped offsets so as to spread the wall load over a larger area of soil, as shown in section, rests on a: **[1 mark]**



(A) Cavity wall

(B) Cantilever retaining wall

(C) Stepped (spread) wall footing

(D) Parapet wall

Q15. The nominal mix proportion (cement : fine aggregate : coarse aggregate, by volume) conventionally associated with M20 grade concrete is: **[1 mark]**

(A) $1 : 2 : 4$

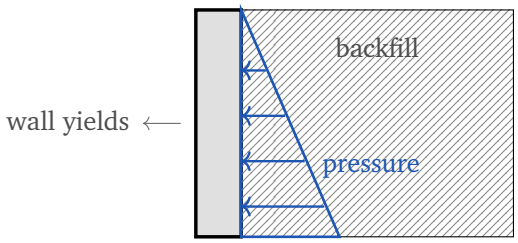
(B) $1 : 1.5 : 3$

(C) $1 : 3 : 6$

(D) $1 : 4 : 8$

Building Structures and Systems

Q16. As a rigid retaining wall yields slightly *away* from the soil it retains, the backfill mobilises its shear strength and exerts on the wall (as sketched by the pressure triangle) the: **[1 mark]**



(A) Passive earth pressure

(B) Surcharge pressure

(C) Uplift pressure

(D) Active earth pressure

Q17. A slender vertical structural member that carries primarily axial compression and may fail by *buckling* before its material reaches its crushing strength is a: **[1 mark]**

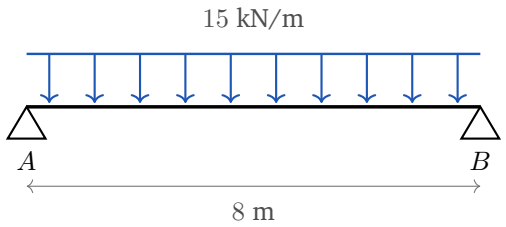
(A) Tie

(B) Beam

(C) Slab

(D) Column (strut)

Q18. A simply supported beam of span 8 m carries a uniformly distributed load of 15 kN/m over its entire length, as shown. By symmetry, the magnitude of each support reaction is: **[1 mark]**



(A) 120 kN

(B) 60 kN

(C) 30 kN

(D) 15 kN

Q19. For a smooth vertical retaining wall with a horizontal cohesionless backfill having an angle of internal friction $\phi = 30^\circ$, Rankine's coefficient of active earth pressure $K_a = \dfrac{1 - \sin\phi}{1 + \sin\phi}$ works out to: **[1 mark]**

(A) 3.00

(B) 0.33

(C) 1.00

(D) 0.50

Q20. In a reinforced-concrete beam that is subjected to *sagging* (positive) bending under gravity loads, the main tensile reinforcement bars are placed: **[1 mark]**

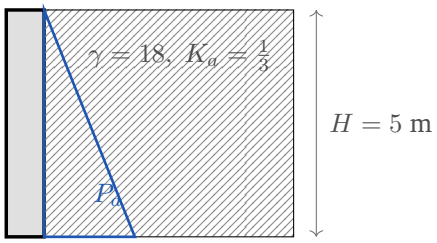
(A) near the top face

(B) along the neutral axis

(C) near the bottom face

(D) equally at the top and bottom faces

Q21. A retaining wall of height $H = 5$ m retains a dry cohesionless backfill of unit weight $\gamma = 18$ kN/m^3 with active earth-pressure coefficient $K_a = \frac{1}{3}$, as shown. The total active earth thrust per metre run of wall, $P_a = \frac{1}{2} K_a \gamma H^2$, is: **[2 marks]**



(A) 150 kN/m

(B) 45 kN/m

(C) 90 kN/m

(D) 75 kN/m

Environmental Design and Building Services

Q22. A town is designed for a population of 50,000 persons with an average water demand of 135 litres per capita per day (lpcd). The average daily water demand of the town is: **[2 marks]**

(A) 3.375 million litres per day

(B) 6.75 million litres per day

(C) 13.5 million litres per day

(D) 0.675 million litres per day

Q23. The "bioclimatic chart" developed by Victor Olgyay locates the human comfort zone and prescribes corrective measures (air movement, shading, added moisture). It is plotted on axes of: [2 marks]

(A) dry-bulb temperature and relative humidity

(B) wind speed and annual rainfall

(C) illuminance and glare index

(D) sound pressure level and frequency

Q24. In a continuously fed municipal water-supply system, the balancing (service) reservoir provided to even out the variation between supply and demand is usually sized at approximately: [2 marks]

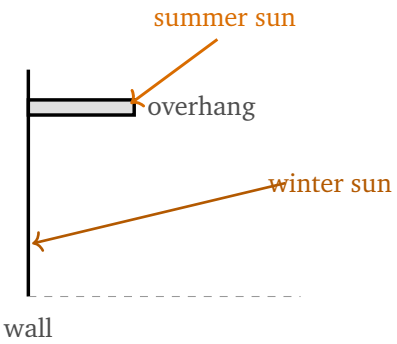
(A) 5% of the maximum daily demand

(B) one-third of the maximum daily demand

(C) three times the maximum daily demand

(D) ten times the maximum daily demand

Q25. A horizontal overhang (chhajja) projecting above a south-facing window in the northern hemisphere is most effective at excluding solar heat gain because it intercepts the high-altitude rays of the: [2 marks]



(A) summer noon sun

(B) winter morning sun

(C) winter noon sun

(D) summer sunrise sun

Q26. For estimating the flow to be handled by a town's sewerage works, the average quantity of sanitary sewage generated is usually taken as a fraction of the water supplied to the town, commonly about: [2 marks]

(A) 80% of the water supply

(B) 20% of the water supply

(C) 150% of the water supply

(D) 10% of the water supply

Q27. For lightly clothed, sedentary occupants, thermal-comfort standards recommend an indoor operative temperature (for still, moderately humid air) of roughly: [2 marks]

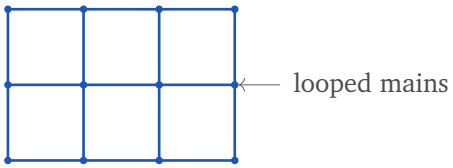
(A) 5–10 °C

(B) 40–45 °C

(C) 23–26 °C

(D) 30–35 °C

Q28. In a water-distribution network, the layout in which the mains are interconnected to form closed loops, so that every point can be supplied from more than one direction and there are no dead ends, as shown, is the: [2 marks]



(A) Dead-end (tree) system

(B) Radial system

(C) Branching system

(D) Grid-iron (ring) system

Q29. The urban-design quality by which a layout offers people a choice of alternative routes to move through an area and reach their destinations, making the environment easy to penetrate, is called: [2 marks]

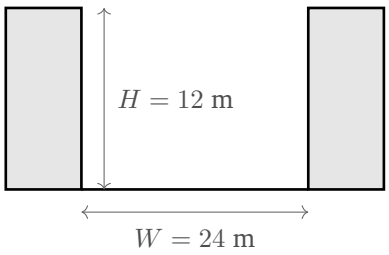
(A) Permeability (connectivity)

(B) Legibility

(C) Enclosure

(D) Robustness

Q30. A city street is lined on both sides by buildings of height 12 m, and the street is 24 m wide between the building faces, as shown in section. The height-to-width (H/W) ratio that governs the sense of enclosure of the street is: [2 marks]



(A) 2.0

(B) 1.0

(C) 0.5

(D) 0.25

Q31. The landscape-design technique of framing and drawing a distant feature lying *outside* the site (a mountain, a temple) into the visual composition of a garden, as classically practised in Japanese gardens, is known as: [2 marks]

(A) Axial vista

(B) Focalization

(C) Enframement

(D) Borrowed scenery (shakkei)

Q32. A large, predominantly hard-paved public open space enclosed by important buildings and serving as a civic gathering place – of which the Piazza San Marco in Venice is a celebrated example – is best described as a(n): [2 marks]

(A) Boulevard

(B) Greenbelt

(C) Cul-de-sac

(D) Urban square (piazza)

Q33. In a hot-dry region, the landscaping approach that deliberately minimises the demand for irrigation water through drought-tolerant native planting, mulching and efficient watering is called: [2 marks]

(A) Softscaping

(B) Topiary

(C) Xeriscaping

(D) Hydroseeding

Urban and Regional Planning and Housing

Q34. The Government of India flagship mission launched in 2015 with the goal of "Housing for All" in urban areas, delivering affordable housing through four verticals – including in-situ slum redevelopment and a credit-linked interest subsidy – is the: [2 marks]

(A) Rajiv Awas Yojana (RAY)

(B) Pradhan Mantri Awas Yojana (Urban)

(C) Jawaharlal Nehru National Urban Renewal Mission

(D) Atal Mission for Rejuvenation and Urban Transformation

Q35. Under PMAY (Urban), the vertical that provides an interest subsidy on housing loans to Economically Weaker Section, Low Income Group and Middle Income Group beneficiaries buying or building a house is the: [2 marks]

(A) In-situ Slum Redevelopment (ISSR)

(B) Credit Linked Subsidy Scheme (CLSS)

(C) Affordable Housing in Partnership (AHP)

(D) Beneficiary-Led Construction (BLC)

Q36. As per the norms adopted under PMAY (Urban), the carpet area of a dwelling unit meant for an Economically Weaker Section (EWS) household is generally taken to be up to about: **[2 marks]**

(A) $30\ \text{m}^2$

(B) $10\ \text{m}^2$

(C) $90\ \text{m}^2$

(D) $150\ \text{m}^2$

Q37. A slum-rehabilitation project must rehouse 800 families on a net residential plot of 4 hectares in walk-up apartment blocks. The net housing density that the scheme must achieve is: **[2 marks]**

(A) 50 dwelling units per hectare

(B) 100 dwelling units per hectare

(C) 400 dwelling units per hectare

(D) 200 dwelling units per hectare

Q38. The town-planning instrument by which an authority pools fragmented land holdings, reconstitutes them into regular serviced plots, returns a portion to the original owners and retains land for roads, open space and public purposes – widely used in Gujarat – is the: **[2 marks]**

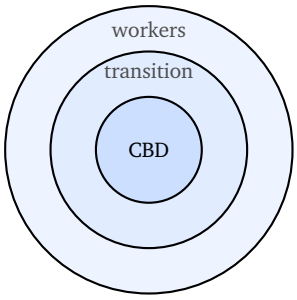
(A) Town Planning Scheme (land pooling / readjustment)

(B) Transferable Development Rights

(C) Betterment levy

(D) Compulsory acquisition (eminent domain)

Q39. In the concentric-zone model of urban structure proposed by E. W. Burgess, the innermost ring, containing the main commercial, retail and office activities, is the: [2 marks]



(A) Zone of workers' homes

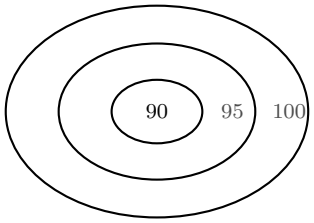
(B) Central Business District (CBD)

(C) Commuter zone

(D) Zone in transition

Planning Techniques, Surveying and GIS

Q40. On a topographic map, a set of closed contour lines whose values *decrease* towards the centre, with the lowest value innermost (often marked with hachures), as shown, represents a: [2 marks]



(A) Depression (pond or pit)

(B) Hill (summit)

(C) Ridge

(D) Uniform slope

Q41. The area of an irregular strip of land is found from offsets taken at a regular interval $d = 10$ m along a survey line. The offsets are $2, 5, 6, 4$ and 3 m. By the trapezoidal rule, $A = d\left[\dfrac{O_0 + O_n}{2} + (O_1 + O_2 + \cdots + O_{n-1})\right]$, the area is: [2 marks]

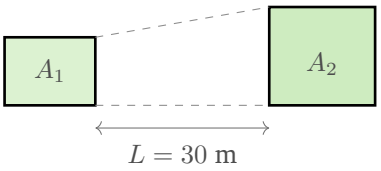
(A) $200\ \text{m}^2$

(B) $150\ \text{m}^2$

(C) $250\ \text{m}^2$

(D) $175\ \text{m}^2$

Q42. Two successive cross-sections of an earthwork, spaced $L = 30$ m apart, have end areas $A_1 = 20\ \text{m}^2$ and $A_2 = 30\ \text{m}^2$, as shown. By the average-end-area (trapezoidal) method, $V = L\left(\dfrac{A_1 + A_2}{2}\right)$, the volume of earthwork between them is: [2 marks]



(A) $500\ \text{m}^3$

(B) $750\ \text{m}^3$

(C) $1500\ \text{m}^3$

(D) $375\ \text{m}^3$

Q43. On a contour map, the constant vertical distance between any two successive contour lines is called the: [2 marks]

(A) horizontal equivalent

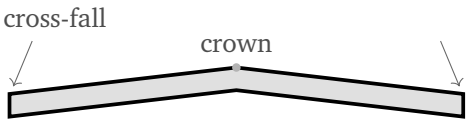
(B) gradient

(C) contour interval

(D) reduced level

Infrastructure, Services and Transportation Planning

Q44. The transverse (cross) slope given to a carriageway, falling from the crown at the centre to the edges so that rainwater drains off quickly, as shown in the cross-section, is called the: [2 marks]



(A) superelevation

(B) gradient

(C) camber (cross-fall)

(D) kerb

Q45. On an urban arterial, the peak-hour traffic volume is 1800 vehicles per hour and the capacity of the road is 3600 vehicles per hour. The volume-to-capacity (v/c) ratio of the road is: **[2 marks]**

(A) 2.00

(B) 0.50

(C) 1.00

(D) 0.25

Q46. An urban public-transport mode that runs high-capacity buses on an exclusive, physically segregated right-of-way with dedicated lanes, level boarding and off-board fare collection is known as: **[2 marks]**

(A) Light Rail Transit

(B) Bus Rapid Transit (BRT)

(C) Personal Rapid Transit

(D) Monorail

Detailed Solutions

Q1.

Solution

Concept – passive-cooling devices in hot-arid vernacular architecture: Traditional builders in hot-dry regions used the wind itself to cool interiors.

Step 1 – read the description: A tall shaft rises above the roof, is open at the top, and directs the outside breeze downward into the rooms.

Step 2 – name the device: This is the **wind tower**, called *badgir* in Persian tradition and used in Rajasthani havelis. It catches the higher, cooler, faster-moving air above roof level and lets it fall into the living space, while warm stale air is drawn out.

Why the other options are wrong:

- A jaali is a perforated stone or lattice screen; it filters light and air but is not a tower.
- A chhajja is a projecting sunshade/eave over an opening.
- A chabutara is a raised masonry plinth or platform, not a ventilation device.

Final Answer: Badgir (wind tower) $\Rightarrow$ A

Answer: (A) Go Back to Q1

Q2.

Solution

Concept – authorship of iconic modern Indian buildings: Landmark buildings are commonly identified by the architect who won or led their design.

Step 1 – recall the building: The Lotus Temple (completed 1986) is a Bahá'ı House of Worship shaped like a half-open lotus, with twenty-seven marble petals grouped in threes to give the nine sides required of a Bahá'ı temple.

Step 2 – name the architect: It was designed by the Iranian-Canadian architect **Fariborz Sahba**.

Why the other options are wrong:

- Charles Correa designed works such as the Kanchanjunga Apartments and Jawahar Kala Kendra, not this temple.
- Balkrishna Doshi is known for Sangath, IIM Bangalore and Aranya housing.
- Louis Kahn designed the IIM Ahmedabad campus, a very different idiom.

Final Answer: Fariborz Sahba $\Rightarrow$ B

Answer: (B) Go Back to Q2

Q3.

Solution

Concept – elements of the Dravidian (South Indian) temple: Each part of a temple has a distinct Sanskrit name that GATE frequently tests.

Step 1 – read the description: A tall, pyramidal, heavily sculpted *gateway* tower stands over the entrance in the enclosing wall (prakara) of the temple.

Step 2 – name it: This entrance tower is the **gopuram**, characteristic of large South Indian temple complexes such as those at Madurai and Srirangam.

Why the other options are wrong:

- The shikhara is the curvilinear tower over the sanctum in North Indian (Nagara) temples.
- The vimana is the tower/superstructure directly above the sanctum in a Dravidian temple, not the gateway.
- The mandapa is a pillared hall in front of the sanctum, not a tower.

Final Answer: Gopuram $\Rightarrow$ D

Answer: (D) Go Back to Q3

Q4.

Solution

Concept – the courtyard house as a climate response: In warm-humid Kerala, a central court brings light, air and rainwater management into the plan.

Step 1 – recall the house type: The traditional Kerala house is the *Nalukettu*, a rectangular block built around a central open court.

Step 2 – name the courtyard: That central open-to-sky courtyard is the **nadumuttam**. It ventilates the surrounding rooms, admits daylight and collects rainwater, all suited to the hot-humid climate.

Why the other options are wrong:

- A deori is a gateway/entrance vestibule, not the central court.
- A haveli is a whole courtyard mansion type of North/West India, not the court itself.

- A wada is a Maharashtrian courtyard mansion type, again not the Kerala court.

Final Answer: Nadumuttam $\Rightarrow$ A

Answer: (A) Go Back to Q4

Q5.

Solution

Concept – leading modern Indian architects and their signature works: Attributing well-known projects to their architects is a standard history question.

Step 1 – read the works named: Sangath (the architect's own studio at Ahmedabad) and the Aranya incremental low-cost housing at Indore.

Step 2 – identify the architect: Both are by **Balkrishna Doshi**, who received the Pritzker Prize in 2018 and was celebrated for humane, climate-conscious, low-cost design.

Why the other options are wrong:

- Charles Correa designed Kanchanjunga and Jawahar Kala Kendra, not Sangath/Aranya.
- Raj Rewal is known for the Asian Games Village and Hall of Nations, Delhi.
- Achyut Kanvinde worked in a Brutalist idiom (for example IIT Kanpur buildings), a different body of work.

Final Answer: Balkrishna Doshi $\Rightarrow$ C

Answer: (C) Go Back to Q5

Q6.

Solution

Concept – Charles Correa's climate-driven design philosophy: Correa argued that in a warm climate the form of a building should be shaped by the need for shade and air movement.

Step 1 – read the example: The "Tube House" has a long, narrow section with a sloped roof and high-level vents so that hot air rises and escapes while cooler air is drawn in low down (the stack effect).

Step 2 – name the maxim: Correa summed up this approach as **"form follows climate"**, making passive cooling the generator of the built form.

Why the other options are wrong:

- "Form follows finance" is a cynical planning phrase, not Correa's design principle.
- "Less is more" is Mies van der Rohe's minimalist dictum.
- "Ornament is crime" is Adolf Loos's polemic against decoration.

Final Answer: "form follows climate" $\Rightarrow$ A

Answer: (A) Go Back to Q6

Q7.

Solution

Concept – ordering principles of composition: Design principles include axis, symmetry, hierarchy, rhythm, datum, gradation and contrast.

Step 1 – read the arrangement: A row of similar elements changes size in regular steps, growing progressively larger along the facade.

Step 2 – name the principle: A stepwise, orderly change in a property (size here) across a series is **gradation**. It produces a graded rhythm and a sense of direction along the elevation.

Why the other options are wrong:

- Rigid symmetry mirrors identical elements about an axis; it does not steadily change their size.
- Radial balance arranges elements about a central point, not in a graded line.
- Random contrast implies no regular pattern, whereas gradation is regular and progressive.

Final Answer: Gradation $\Rightarrow$ C

Answer: (C) Go Back to Q7

Q8.

Solution

Concept – classical Indian treatises on building (Shilpa Shastra): Traditional Indian design followed canonical texts that fixed proportion and orientation.

Step 1 – identify the text: Among the classical Shilpa Shastras, the **Manasara** is the best known treatise on architecture and sculpture, laying down modules of

proportion, temple types, town layouts and orientation (a source of Vastu principles).

Step 2 – confirm the domain: Its subject is building and image-making, exactly what the question describes.

Why the other options are wrong:

- The Arthashastra (Kautilya) is a treatise on statecraft and economics, though it touches on fort/town layout, it is not the Shilpa Shastra meant here.
- The Charaka Samhita is a foundational text of Ayurveda (medicine).
- The Natyashastra (Bharata) deals with dramaturgy, dance and music.

Final Answer: Manasara $\Rightarrow$ C

Answer: (C) Go Back to Q8

Q9.

Solution

Concept – naming brick masonry bonds: A bond is the pattern in which bricks are laid so that vertical joints do not align.

Step 1 – read the pattern: Every course contains headers and stretchers placed alternately, with each header sitting centrally over the stretcher below.

Step 2 – name the bond: This is the **Flemish bond**. Because headers and stretchers alternate within each course, it gives a strong bond and an attractive chequered face.

Why the other options are wrong:

- In a stretcher bond every brick is laid as a stretcher (used mainly for half-brick partition walls).
- In a header bond every brick is laid as a header (used for curved work and one-brick-thick footings).
- In a stack bond bricks are simply stacked with continuous vertical joints, giving little strength.

Final Answer: Flemish bond $\Rightarrow$ D

Answer: (D) Go Back to Q9

Q10.

Solution

Concept – standard size of a concrete masonry block: Concrete blocks are made to a modular (co-ordinating) size that includes the mortar joint.

Step 1 – recall the common block size: The widely used concrete block has a nominal (co-ordinating) size of $400 \times 200 \times 200$ **mm**, i.e. an actual block of about $390 \times 190 \times 190$ mm plus a 10 mm mortar joint.

Step 2 – note the advantage: One such block replaces several bricks, so block masonry is laid faster and gives a lighter wall on a tidy 200 mm module.

Why the other options are wrong:

- $200 \times 100 \times 100$ mm is the modular size of a clay *brick*, not a concrete block.
- $300 \times 200 \times 150$ mm is not a standard block designation.
- $500 \times 250 \times 250$ mm is larger than the standard unit and would be too heavy to handle by hand.

Final Answer: $400 \times 200 \times 200$ mm $\Rightarrow$ C

Answer: (C) Go Back to Q10

Q11.

Solution

Concept – expected activity time in PERT: PERT combines three time estimates into a weighted mean, weighting the most-likely time four times.

Step 1 – write the formula: $t_e = \dfrac{t_o + 4t_m + t_p}{6}$

Step 2 – list the data: $t_o = 4$, $t_m = 7$, $t_p = 16$ days.

Step 3 – compute the middle term: $4 \times t_m = 4 \times 7 = 28$

Step 4 – add the three terms: $t_o + 4t_m + t_p = 4 + 28 + 16 = 48$

Step 5 – divide by 6**:** $t_e = \dfrac{48}{6} = 8$ days.

Why the other options are wrong:

- 9 days would come from a wrong sum of 54.
- 7 days ignores the weighting and just takes the most-likely value.
- 6.5 days averages only t_o and t_p, omitting t_m.

Final Answer: $t_e = 8$ days $\Rightarrow$ D

Answer: (D) Go Back to Q11

Q12.

Solution

Concept – quality limits for building bricks: Water absorption is a key index of brick quality; a good brick is dense and absorbs little water.

Step 1 – recall the test: A dry brick is weighed, immersed in cold water for 24 hours, then weighed again; the gain in weight as a percentage of the dry weight is the water absorption.

Step 2 – state the limit: For a good *first-class* brick this must *not exceed about* 20% of the dry weight.

Why the other options are wrong:

- 5% is far stricter than the code needs for a first-class brick (nearer to engineering/paving bricks).
- 40% and 60% indicate a very porous, under-burnt, poor-quality brick that would not qualify as first class.

Final Answer: about $20\% \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q12

Q13.

Solution

Concept – cut bricks (closers) used to complete a bond: Closers are portion-bricks laid near the quoin (corner) so that the bond pattern comes out right and joints break properly.

Step 1 – read the description: A brick cut *along its length* so that only half the width remains (the full length is kept).

Step 2 – name it: This is a **queen closer**. Placed next to the quoin header, it shifts the vertical joints by a quarter brick and so maintains the lap.

Why the other options are wrong:

- A king closer is made by cutting off one corner, giving half a header and half a stretcher face, not a half-width strip.
- A bat is a brick cut *across* its length (half bat, three-quarter bat), reducing its length, not its width.

- A bevelled closer has one end cut on a slant, used at squint quoins, not a straight half-width cut.

Final Answer: Queen closer $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q13

Q14.

Solution

Concept – spreading a wall load onto the soil: A masonry wall carries a line load that must be spread to keep the soil pressure within its safe bearing capacity.

Step 1 – read the section: The base of the wall is widened downward in a series of stepped offsets, each course projecting a little beyond the one above.

Step 2 – name it: This is a **stepped (spread) wall footing**. The offsets increase the width of contact with the soil, reducing the bearing pressure under the wall.

Why the other options are wrong:

- A cavity wall is two leaves separated by an air gap for insulation, not a widened base.
- A cantilever retaining wall holds back earth on one side; here the wall simply carries its own vertical load to the soil.
- A parapet wall is a low wall at roof edge, carrying no building load to the ground.

Final Answer: Stepped (spread) wall footing $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q14

Q15.

Solution

Concept – nominal mix proportions of concrete grades: Nominal mixes fix the cement : sand : coarse-aggregate ratio by volume for ordinary work.

Step 1 – recall the standard ladder: $\text{M10} = 1:3:6$, $\text{M15} = 1:2:4$, $\text{M20} = 1:1.5:3$.

Step 2 – pick M20: The proportion for **M20** is $1:1.5:3$ (one part cement to one-and-a-half parts fine aggregate to three parts coarse aggregate).

Why the other options are wrong:

- $1:2:4$ is the nominal mix for M15, a lower grade.
- $1:3:6$ is the nominal mix for M10, lower still.
- $1:4:8$ corresponds to lean M7.5 concrete used for levelling/PCC.

Final Answer: $1:1.5:3 \Rightarrow \boxed{B}$

Answer: (B) Go Back to Q15

Q16.

Solution

Concept – states of lateral earth pressure: The pressure a soil exerts on a wall depends on which way, and how far, the wall moves.

Step 1 – read the movement: The wall yields slightly *away* from the backfill, allowing the soil behind it to expand and mobilise its full shearing resistance.

Step 2 – name the pressure: When the wall moves away and the soil is on the verge of sliding down and outward, the pressure is at its *minimum* value: the **active earth pressure**. Its resultant acts at one-third of the height from the base, as the triangular distribution shows.

Why the other options are wrong:

- Passive pressure is the much larger pressure that develops when the wall is pushed *into* the soil.
- Surcharge is an extra load placed on top of the backfill, not the state of the earth pressure itself.
- Uplift pressure is water pressure acting upward on a base, unrelated to lateral yielding.

Final Answer: Active earth pressure $\Rightarrow \boxed{D}$

Answer: (D) Go Back to Q16

Q17.

Solution

Concept – structural members classified by their action: Members are named by whether they carry tension, compression, bending or a mix.

Step 1 – read the description: A slender vertical member carries mainly axial compression and may fail by buckling (sideways instability) before the material is crushed.

Step 2 – name it: This is a **column** (or, more generally, a strut). Its load capacity is often governed by buckling, so slenderness is a key design parameter.

Why the other options are wrong:

- A tie carries axial *tension* and cannot buckle.
- A beam carries transverse load mainly in bending, not axial compression.
- A slab is a two-dimensional plate carrying load in flexure.

Final Answer: Column (strut) $\Rightarrow$ D

Answer: (D) Go Back to Q17

Q18.

Solution

Concept – reactions of a symmetrically loaded simple beam: For a symmetric load on a simply supported beam, the total load splits equally between the two supports.

Step 1 – find the total load: Total load $W = w \times L = 15 \times 8 = 120$ kN.

Step 2 – use symmetry: The UDL is symmetric about mid-span, so $R_A = R_B$.

Step 3 – share the load: $R_A = R_B = \dfrac{W}{2} = \dfrac{120}{2}$

Step 4 – evaluate: $R_A = R_B = 60$ kN.

Why the other options are wrong:

- 120 kN is the total load, not a single reaction.
- 30 kN would be a quarter of the load, not half.
- 15 kN is the load intensity per metre, not a reaction.

Final Answer: 60 kN $\Rightarrow$ B

Answer: (B) Go Back to Q18

Q19.

Solution

Concept – Rankine's active earth-pressure coefficient: For a smooth wall with level cohesionless backfill, K_a depends only on the friction angle ϕ.

Step 1 – write the formula: $K_a = \dfrac{1 - \sin\phi}{1 + \sin\phi}$

Step 2 – put $\phi = 30°$: $\sin 30° = 0.5$

Step 3 – substitute: $K_a = \dfrac{1 - 0.5}{1 + 0.5} = \dfrac{0.5}{1.5}$

Step 4 – evaluate: $K_a = \dfrac{1}{3} \approx 0.33.$

Why the other options are wrong:

- 3.00 is the reciprocal, which is K_p (the passive coefficient) for $\phi = 30°$.
- 1.00 is the at-rest-like value only for $\phi = 0$.
- 0.50 comes from wrongly taking $K_a = 1 - \sin\phi$.

Final Answer: $K_a \approx 0.33 \Rightarrow$ B

Answer: (B) Go Back to Q19

Q20.

Solution

Concept – placing reinforcement in a bending member: Concrete is weak in tension, so steel is placed where the section is in tension.

Step 1 – locate the tension: Under sagging (positive) moment the beam bends concave-up, so the *bottom* fibres stretch and go into tension while the top fibres are compressed.

Step 2 – place the steel: The main tensile reinforcement is therefore placed **near the bottom face**, close to the tension fibres, to carry the tensile force the concrete cannot.

Why the other options are wrong:

- Near the top face there is compression, which the concrete resists on its own (bars here suit hogging zones).
- At the neutral axis the bending stress is zero, so flexural steel there is ineffective.
- Equal top and bottom steel is used only where the moment reverses; for pure sagging the tension steel belongs at the bottom.

Final Answer: near the bottom face $\Rightarrow$ C

Answer: (C) Go Back to Q20

Q21.

Solution

Concept – total active thrust on a retaining wall: The active pressure grows linearly with depth, so its resultant is the area of a triangular pressure diagram.

Step 1 – write the formula: $P_a = \dfrac{1}{2} K_a \gamma H^2$

Step 2 – list the data: $K_a = \dfrac{1}{3}$, $\gamma = 18$ kN/m^3, $H = 5$ m.

Step 3 – compute H^2: $H^2 = 5^2 = 25$ m^2

Step 4 – multiply γH^2: $18 \times 25 = 450$

Step 5 – apply K_a: $\dfrac{1}{3} \times 450 = 150$

Step 6 – take one-half: $P_a = \dfrac{1}{2} \times 150 = 75$ kN/m.

Why the other options are wrong:

- 150 kN/m omits the factor $\frac{1}{2}$.
- 45 kN/m mishandles the H^2 term.
- 90 kN/m uses a wrong K_a or height.

Final Answer: $P_a = 75$ kN/m $\Rightarrow$ D

Answer: (D) Go Back to Q21

Q22.

Solution

Concept – average daily water demand of a town: Total demand equals per-capita demand multiplied by the population served.

Step 1 – write the relation: Average daily demand = population $\times$ per-capita demand.

Step 2 – list the data: Population = 50,000; per-capita demand = 135 lpcd.

Step 3 – multiply: $50{,}000 \times 135 = 6{,}750{,}000$ litres/day.

Step 4 – convert to million litres per day: 6,750,000 litres/day = 6.75 MLD.

Why the other options are wrong:

- 3.375 MLD halves the correct figure (as if 67.5 lpcd).
- 13.5 MLD doubles it (as if 270 lpcd).
- 0.675 MLD is out by a factor of ten.

Final Answer: 6.75 MLD $\Rightarrow$ B

Answer: (B) Go Back to Q22

Q23.

Solution

Concept – Olgyay's bioclimatic chart: The bioclimatic chart shows, for given outdoor conditions, whether a person is comfortable and, if not, what correction is needed.

Step 1 – recall the axes: The chart is drawn with **dry-bulb temperature** on the vertical axis and **relative humidity** on the horizontal axis, with the comfort zone marked as a region on it.

Step 2 – note its use: Points falling above the comfort zone call for air movement or shading; points below call for solar heating or added moisture, and the chart quantifies, for example, the wind speed needed to restore comfort.

Why the other options are wrong:

- Wind speed and rainfall are climatic inputs but are not the two axes of the bioclimatic chart.
- Illuminance and glare index belong to daylighting analysis.
- Sound level and frequency belong to acoustics, not thermal comfort.

Final Answer: dry-bulb temperature and relative humidity $\Rightarrow$ A

Answer: (A) Go Back to Q23

Q24.

Solution

Concept – purpose and size of a balancing (service) reservoir: A service reservoir stores water when supply exceeds demand and releases it when demand exceeds supply, evening out the daily variation.

Step 1 – recall the design rule: For a town supplied continuously over 24 hours, the balancing storage needed to cover the demand pattern is commonly taken as about **one-third** of the maximum daily demand.

Step 2 – note added allowances: To this balancing storage, designers usually add a breakdown (emergency) reserve and a fire reserve, but the balancing component itself is around one-third of a day's (maximum) supply.

Why the other options are wrong:

- 5% is far too small to absorb the day's peaks and troughs.
- Three times the maximum daily demand would be an enormous, uneconomic tank.
- Ten times the maximum daily demand is wholly unrealistic.

Final Answer: one-third of the maximum daily demand $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q24

Q25.

Solution

Concept – how a horizontal overhang shades a south window: A fixed horizontal overhang works because the sun's altitude changes with the season.

Step 1 – summer condition: At summer noon the sun is high in the sky. Its steep rays strike the overhang and are cut off before they reach the glass, so heat gain is excluded.

Step 2 – winter condition: At winter noon the sun is low. Its shallow rays slip *under* the same overhang and reach deep into the room, giving welcome warmth.

Step 3 – identify what is blocked: Thus the overhang is designed to intercept the **high summer noon sun**, the very condition when shading is most needed.

Why the other options are wrong:

- The winter morning and winter noon sun are low, and a horizontal overhang deliberately lets them in.
- At summer sunrise the sun is in the east at a low angle; a horizontal south overhang does little then (a vertical fin would be needed), so it is not the design case.

Final Answer: summer noon sun $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q25

Q26.

Solution

Concept – relating sewage flow to water supply: Most of the water piped into a town leaves as wastewater, so sewage flow is estimated as a fraction of water supply.

Step 1 – recall the fraction: The dry-weather sanitary sewage produced is usually taken as about 80% of the water supplied.

Step 2 – explain the loss: The remaining $\sim 20\%$ does not reach the sewers: it is consumed, evaporates, is used for gardening/washing that soaks away, or is lost in the distribution system.

Why the other options are wrong:

- 20% inverts the figure; that fraction is the water *not* returning as sewage.
- 150% would mean more sewage than water supplied, which is impossible for dry-weather flow.
- 10% grossly under-estimates the return and would badly undersize the sewers.

Final Answer: about 80% of the water supply $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q26

Q27.

Solution

Concept – the thermal comfort band for indoor spaces: Comfort standards define a narrow range of operative temperature for sedentary indoor occupants.

Step 1 – recall the range: For lightly clothed people doing sedentary work, with still air and moderate humidity, the comfortable operative temperature is roughly 23–26 **°C** (broadly the 22–27 °C band).

Step 2 – interpret: Below this band people feel cold and need heating or solar gain; above it they feel hot and need air movement, shading or cooling.

Why the other options are wrong:

- 5–10 °C is far too cold for indoor comfort.
- 40–45 °C is well into heat-stress territory.
- 30–35 °C is warmer than the accepted comfort band for sedentary occupants.

Final Answer: 23–26 °C $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q27

Q28.

Solution

Concept – layouts of a water-distribution network: Distribution systems differ in whether the mains form dead ends or interconnected loops.

Step 1 – read the layout: The mains are laid in a rectangular grid and cross-connected so that the pipes form closed loops, and every junction can receive water from more than one direction.

Step 2 – name it: This is the **grid-iron (ring) system**. Because there are no dead ends, water does not stagnate, and if one main is shut for repair, supply reaches consumers by an alternative path.

Why the other options are wrong:

- The dead-end (tree) system has branches ending blind, where water can stagnate and only one path feeds each point.
- The radial system distributes outward from central reservoirs to zones, not as interconnected loops.
- The branching system is another name for a tree-like dead-end layout, again without loops.

Final Answer: Grid-iron (ring) system $\Rightarrow$ D

Answer: (D) Go Back to Q28

Q29.

Solution

Concept – responsive urban-design qualities: Good urban form is often judged by qualities such as permeability, legibility, variety and robustness.

Step 1 – read the description: A layout that gives people a choice of alternative routes and makes it easy to move through and reach places.

Step 2 – name the quality: This is **permeability** (or connectivity). A finely connected street network with many route choices is highly permeable; a layout of cul-de-sacs and superblocks is not.

Why the other options are wrong:

- Legibility is how easily people can understand and form a mental map of a

place, not the choice of routes.
- Enclosure is the degree to which a space is defined by surrounding built edges.
- Robustness is the capacity of a space or building to serve many different uses over time.

Final Answer: Permeability (connectivity) $\Rightarrow$ A

Answer: (A) Go Back to Q29

Q30.

Solution

Concept – height-to-width ratio and the sense of enclosure: The ratio of building height to street width (H/W) controls how enclosed a street feels.

Step 1 – list the data: Building height $H = 12$ m; street width $W = 24$ m.

Step 2 – write the ratio: $\frac{H}{W} = \frac{12}{24}$

Step 3 – evaluate: $\frac{H}{W} = 0.5$.

Step 4 – interpret: At $H/W = 0.5$ the street is twice as wide as the buildings are tall, giving a fairly open, weakly enclosed street; ratios near 1 feel comfortably enclosed, and above 1 feel canyon-like.

Why the other options are wrong:

- 2.0 inverts the ratio (W/H).
- 1.0 would need equal height and width (24 m tall on a 24 m street).
- 0.25 would need a 6 m height on a 24 m street.

Final Answer: $H/W = 0.5 \Rightarrow$ C

Answer: (C) Go Back to Q30

Q31.

Solution

Concept – borrowing distant views into a landscape: Landscape composition can incorporate features that lie beyond the garden boundary.

Step 1 – read the description: A distant hill, temple or tree outside the site is deliberately framed by the garden so that it reads as part of the composition.

Step 2 – name the technique: This is **borrowed scenery**, the Japanese *shakkei*,

in which foreground planting and openings capture and integrate a background view.

Why the other options are wrong:

- An axial vista is a view along a straight axis *within* the design, not a borrowed external feature.
- Focalization directs the eye to a focal point inside the composition.
- Enframement is the general framing of a view; "borrowed scenery" is the specific term for capturing an *external* feature.

Final Answer: Borrowed scenery (shakkei) $\Rightarrow$ D

Answer: (D) Go Back to Q31

Q32.

Solution

Concept – types of urban open space: Public open spaces are classified by their form and role in the city.

Step 1 – read the description: A large, mainly hard-paved space, enclosed by important buildings, used as a civic gathering place; the example is the Piazza San Marco.

Step 2 – name it: This is an **urban square** (piazza). Its enclosing facades and paved floor make it a room-like outdoor space for public life.

Why the other options are wrong:

- A boulevard is a wide tree-lined *street*, a linear element, not an enclosed square.
- A greenbelt is a ring of protected open/agricultural land around a town.
- A cul-de-sac is a dead-end residential street, not a civic space.

Final Answer: Urban square (piazza) $\Rightarrow$ D

Answer: (D) Go Back to Q32

Q33.

Solution

Concept – water-wise landscaping in dry climates: In arid regions, landscape design aims to keep planting alive with the least possible irrigation.

Step 1 – read the measures: Drought-tolerant native species, mulching to retain soil moisture, grouping plants by water need, and efficient (drip) irrigation.

Step 2 – name the approach: Together these define **xeriscaping**, a landscaping method that minimises or eliminates the need for supplemental water.

Why the other options are wrong:

- Softscaping simply means using living plant material, with no water-saving intent.
- Topiary is the art of clipping shrubs into shapes, unrelated to water use.
- Hydroseeding is a method of sowing a seed-slurry, not a low-water design philosophy.

Final Answer: Xeriscaping $\Rightarrow$ C

Answer: (C) Go Back to Q33

Q34.

Solution

Concept – India's flagship urban affordable-housing mission: Several schemes have targeted urban housing; the current umbrella mission has a distinctive four-vertical structure.

Step 1 – read the clues: Launched in 2015, "Housing for All" in urban areas, delivered through four verticals including in-situ slum redevelopment and a credit-linked subsidy.

Step 2 – name the mission: This is the **Pradhan Mantri Awas Yojana (Urban)**, whose four verticals are ISSR, CLSS, AHP and Beneficiary-Led Construction.

Why the other options are wrong:

- Rajiv Awas Yojana was the earlier (2011) slum-free-city scheme, superseded by PMAY.
- JNNURM (2005) was a broader urban-renewal mission with a housing sub-mission, not the 2015 "Housing for All" programme.
- AMRUT deals with basic urban infrastructure (water, sewerage, transport), not housing units.

Final Answer: Pradhan Mantri Awas Yojana (Urban) $\Rightarrow$ B

Answer: (B) Go Back to Q34

Q35.

Solution

Concept – the four verticals of PMAY (Urban): Each vertical of the mission uses a different delivery mechanism to make housing affordable.

Step 1 – read the description: An *interest subsidy* on home loans, offered to EWS, LIG and MIG households buying or building a house.

Step 2 – name the vertical: This is the **Credit Linked Subsidy Scheme (CLSS)**, under which the government pays part of the loan interest so that monthly instalments become affordable.

Why the other options are wrong:

- In-situ Slum Redevelopment (ISSR) rebuilds slums on the same land using land as a resource, not a loan subsidy.
- Affordable Housing in Partnership (AHP) gives a fixed grant per EWS unit built in partnership projects.
- Beneficiary-Led Construction (BLC) gives assistance to individual eligible families to build or enhance their own house.

Final Answer: Credit Linked Subsidy Scheme (CLSS) $\Rightarrow$ B

Answer: (B) Go Back to Q35

Q36.

Solution

Concept – dwelling-size norms for affordable housing: The mission sets carpet-area ceilings for each income category.

Step 1 – recall the EWS norm: Under PMAY (Urban), an Economically Weaker Section dwelling is taken to have a carpet area of up to about 30 **m**^{2} (states may enhance it with approval).

Step 2 – place it in context: For comparison, LIG units are allowed a larger carpet area (of the order of 60 m^2), so 30 m^2 is the EWS figure.

Why the other options are wrong:

- 10 m^2 is smaller than a single habitable room standard and far below the norm.
- 90 m^2 and 150 m^2 correspond to middle- and higher-income housing, not EWS.

Final Answer: 30 m^2 $\Rightarrow$ A

Answer: (A) Go Back to Q36

Q37.

Solution

Concept – net housing density: Net housing density is the number of dwelling units divided by the net residential land area.

Step 1 – write the relation: Net density $= \dfrac{\text{number of dwelling units}}{\text{net residential area}}$

Step 2 – list the data: Number of units $= 800$; net area $= 4$ ha.

Step 3 – substitute: Net density $= \dfrac{800}{4}$

Step 4 – evaluate: Net density $= 200$ dwelling units per hectare.

Step 5 – interpret: A density of 200 DU/ha calls for walk-up or low-rise-high-density blocks, typical of slum-rehabilitation schemes on scarce urban land.

Why the other options are wrong:

- 50 DU/ha would need 16 ha for 800 units.
- 100 DU/ha would need 8 ha.
- 400 DU/ha would fit 800 units on only 2 ha.

Final Answer: 200 dwelling units per hectare $\Rightarrow$ D

Answer: (D) Go Back to Q37

Q38.

Solution

Concept – land pooling as a planning instrument: Some tools assemble land for planned development without outright purchase of every parcel.

Step 1 – read the mechanism: Fragmented holdings are pooled, reconstituted into regular serviced “final plots”, a portion is retained for roads, open space and public purposes, and the rest is returned to owners.

Step 2 – name it: This is the **Town Planning Scheme** (land pooling / land readjustment), used extensively in Gujarat and Maharashtra to develop urban extensions with owner participation.

Why the other options are wrong:

- Transferable Development Rights compensate an owner with development rights usable elsewhere, not by reconstituting plots.
- A betterment levy is a charge recovering the rise in land value from public works, not a land-assembly tool.
- Compulsory acquisition (eminent domain) buys land outright against compensation, the opposite of the participatory pooling described.

Final Answer: Town Planning Scheme (land pooling / readjustment) $\Rightarrow$ A

Answer: (A) Go Back to Q38

Q39.

Solution

Concept – Burgess's concentric-zone model: This classic 1925 model of the Chicago School describes urban land use as a set of rings around the centre.

Step 1 – read the description: The innermost ring holds the main commercial, retail and office activity of the city.

Step 2 – name it: The core ring is the **Central Business District (CBD)**. Around it lie, in order, the zone in transition, the zone of workers' homes, better residences, and the outer commuter zone.

Why the other options are wrong:

- The zone of workers' homes is the third ring out, not the core.
- The commuter zone is the outermost ring.
- The zone in transition is the second ring, of mixed and deteriorating use surrounding the CBD.

Final Answer: Central Business District (CBD) $\Rightarrow$ B

Answer: (B) Go Back to Q39

Q40.

Solution

Concept – reading landforms from contour lines: The way contour values change tells whether the ground rises or falls toward the centre.

Step 1 – read the values: The contour values *decrease* inward, so the ground gets *lower* toward the middle of the closed loops.

Step 2 – name the landform: A closed set of contours enclosing successively lower ground is a **depression** (a pit or pond). Hachure ticks are often drawn pointing into the low ground.

Why the other options are wrong:

- A hill (summit) shows closed contours with values *increasing* inward.
- A ridge shows contours bulging (V- or U-shaped) toward lower ground along a line, not concentric closed loops.
- A uniform slope shows straight, evenly spaced, roughly parallel contours, not closed loops.

Final Answer: Depression (pond or pit) $\Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q40

Q41.

Solution

Concept – area by the trapezoidal rule: The trapezoidal rule adds the average of the two end offsets to the sum of all the intermediate offsets, times the interval.

Step 1 – write the formula: $A = d\left[\dfrac{O_0 + O_n}{2} + (O_1 + O_2 + \cdots + O_{n-1})\right]$

Step 2 – identify the offsets: $O_0 = 2$, $O_1 = 5$, $O_2 = 6$, $O_3 = 4$, $O_4 = 3$ m, with $d = 10$ m.

Step 3 – average the end offsets: $\dfrac{O_0 + O_n}{2} = \dfrac{2+3}{2} = \dfrac{5}{2} = 2.5$

Step 4 – sum the intermediate offsets: $O_1 + O_2 + O_3 = 5 + 6 + 4 = 15$

Step 5 – add the two parts: $2.5 + 15 = 17.5$

Step 6 – multiply by the interval: $A = 10 \times 17.5 = 175$ m^2.

Why the other options are wrong:

- 200 m^2 comes from adding all five offsets (20) without halving the end ones.
- 150 m^2 counts only the three interior offsets.

- $250\ \text{m}^2$ overcounts the end offsets.

Final Answer: $A = 175\ \text{m}^2 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q41

Q42.

Solution

Concept – volume of earthwork by the average-end-area method: The volume between two cross-sections is the mean of their areas multiplied by the distance between them.

Step 1 – write the formula: $V = L\left(\dfrac{A_1 + A_2}{2}\right)$

Step 2 – list the data: $A_1 = 20\ \text{m}^2$, $A_2 = 30\ \text{m}^2$, $L = 30\ \text{m}$.

Step 3 – add the end areas: $A_1 + A_2 = 20 + 30 = 50$

Step 4 – take the mean: $\dfrac{50}{2} = 25\ \text{m}^2$

Step 5 – multiply by the length: $V = 30 \times 25 = 750\ \text{m}^3$.

Why the other options are wrong:

- $500\ \text{m}^3$ uses only the smaller area ($20 \times 30\times$ wrong handling).
- $1500\ \text{m}^3$ forgets to halve the sum of the areas.
- $375\ \text{m}^3$ halves the mean area a second time.

Final Answer: $V = 750\ \text{m}^3 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q42

Q43.

Solution

Concept – the basic terms of contouring: Contour maps have standard terms for vertical and horizontal spacing.

Step 1 – read the definition: The constant *vertical* distance between two successive contour lines.

Step 2 – name it: This is the **contour interval**. It is fixed for a given map (for example 0.5 m, 1 m or 5 m) and is chosen to suit the scale and the relief of the ground.

Why the other options are wrong:

- The horizontal equivalent is the *horizontal* distance between two successive contours, which varies with slope.
- The gradient is the ratio of the contour interval to the horizontal equivalent (the steepness).
- The reduced level is the height of a single point above the datum, not a spacing between contours.

Final Answer: Contour interval $\Rightarrow$ C

Answer: (C) Go Back to Q43

Q44.

Solution

Concept – the cross-slope of a road surface: Roads are shaped in cross-section so that rainwater runs off quickly to the edges.

Step 1 – read the description: The surface falls from a high crown at the centre down to both edges, a transverse slope for drainage.

Step 2 – name it: This transverse slope is the **camber** (or cross-fall). It sheds rain to the side drains, preventing water from standing on and weakening the pavement.

Why the other options are wrong:

- Superelevation is the transverse slope raised on the *outer* edge at a horizontal curve to counter centrifugal force, a different purpose.
- Gradient is the *longitudinal* slope of the road along its length.
- A kerb is the raised edge between the carriageway and footpath, not a slope.

Final Answer: Camber (cross-fall) $\Rightarrow$ C

Answer: (C) Go Back to Q44

Q45.

Solution

Concept – the volume-to-capacity ratio of a road: The v/c ratio compares the traffic demand with the road's capacity and measures how congested it is.

Step 1 – write the relation: $\dfrac{v}{c} = \dfrac{\text{peak-hour volume}}{\text{capacity}}$

Step 2 – list the data: Volume $v = 1800$ veh/h; capacity $c = 3600$ veh/h.

Step 3 – substitute: $\frac{v}{c} = \frac{1800}{3600}$

Step 4 – evaluate: $\frac{v}{c} = 0.50$.

Step 5 – interpret: A v/c of 0.5 means the road is carrying half its capacity, a comfortable, free-flowing level of service.

Why the other options are wrong:

- 2.00 inverts the ratio (c/v).
- 1.00 would mean volume equalling capacity (at-capacity flow).
- 0.25 would need a volume of only 900 veh/h.

Final Answer: $v/c = 0.50 \Rightarrow$ B

Answer: (B) Go Back to Q45

Q46.

Solution

Concept – mass transit modes and their features: Public-transport modes differ in their vehicles, right-of-way and boarding arrangements.

Step 1 – read the features: High-capacity buses running on an *exclusive, physically segregated* lane, with level boarding and off-board (pre-paid) fare collection.

Step 2 – name the mode: These are the hallmarks of **Bus Rapid Transit (BRT)**, which gives buses metro-like priority and boarding at far lower cost than rail (as in Ahmedabad's Janmarg).

Why the other options are wrong:

- Light Rail Transit runs rail vehicles on tracks, not buses.
- Personal Rapid Transit uses small automated pods on a guideway for individual trips.
- A monorail runs rail cars on a single elevated beam, again a rail, not a bus, system.

Final Answer: Bus Rapid Transit (BRT) $\Rightarrow$ B

Answer: (B) Go Back to Q46

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	A	2	B	3	D	4	A	5	C
6	A	7	C	8	C	9	D	10	C
11	D	12	A	13	A	14	C	15	B
16	D	17	D	18	B	19	B	20	C
21	D	22	B	23	A	24	B	25	A
26	A	27	C	28	D	29	A	30	C
31	D	32	D	33	C	34	B	35	B
36	A	37	D	38	A	39	B	40	A
41	D	42	B	43	C	44	C	45	B
46	B								