GATE Architecture and Planning

Sample Paper – 5

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. The Heydar Aliyev Center in Baku (2012), famous for its continuous, flowing, column-free surfaces that dissolve the distinction between wall, roof and ground, was designed by: **[1 mark]**

(A) Rem Koolhaas

(B) Frank Gehry

(C) Zaha Hadid

(D) Daniel Libeskind

Q2. The Guggenheim Museum Bilbao (1997), clad in shimmering titanium panels and shaped as a cluster of writhing sculptural volumes, is a landmark of Deconstructivist architecture designed by: [1 mark]

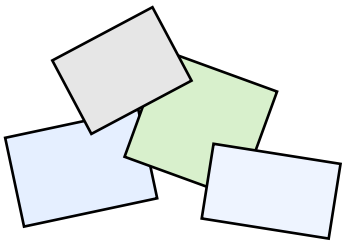
(A) Frank Gehry

(B) Rem Koolhaas

(C) Peter Eisenman

(D) Bernard Tschumi

Q3. Deconstructivist architecture is marked by fragmentation, non-rectilinear tilted forms and an appearance of controlled chaos and dislocated geometry, as suggested below. The movement was crystallised by the 1988 "Deconstructivist Architecture" exhibition at the Museum of Modern Art, New York, curated by: [1 mark]



(A) Louis Sullivan

(B) Kenneth Frampton

(C) Philip Johnson

(D) Reyner Banham

Q4. The CCTV Headquarters in Beijing (2012), a continuous loop of two leaning towers joined by cantilevered horizontal sections to form a three-dimensional "Z", was designed by the office OMA led by: [1 mark]

(A) Zaha Hadid

(B) Rem Koolhaas

(C) Norman Foster

(D) Renzo Piano

Q5. The influential book *Delirious New York: A Retroactive Manifesto for Manhattan* (1978), which theorised the "culture of congestion", was written by: **[1 mark]**

(A) Rem Koolhaas

(B) Robert Venturi

(C) Aldo Rossi

(D) Charles Jencks

Q6. The Postmodern dictum "Less is a bore", coined as a deliberate retort to Mies van der Rohe's "Less is more", was put forward by: **[1 mark]**

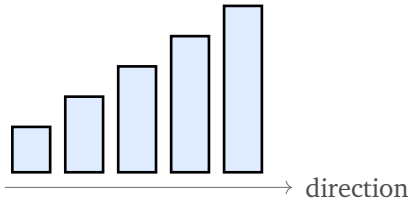
(A) Robert Venturi

(B) Philip Johnson

(C) Le Corbusier

(D) Walter Gropius

Q7. The ordering principle of composition in which a repeated element is developed with a progressive, graduated change in one attribute (here, steadily increasing height) so as to lead the eye in a direction, as sketched, is called: **[1 mark]**



(A) Symmetry

(B) Datum

(C) Contrast

(D) Rhythm (gradation)

Q8. Daniel Libeskind's Jewish Museum, Berlin (1999), with its lightning-bolt (zig-zag) plan sliced by sharp angular "voids", is a leading example of which architectural movement? [1 mark]

(A) Art Nouveau

(B) Deconstructivism

(C) Brutalism

(D) Neoclassicism

Building Construction, Materials and Management

Q9. A building method in which structural members (columns, beams, slabs, wall panels) are cast and cured in a controlled factory or casting yard and then transported to site only for erection and jointing is called: [1 mark]

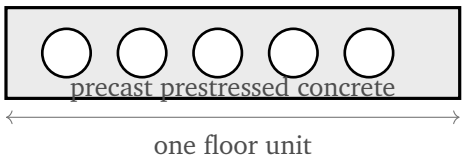
(A) Prefabrication (precast construction)

(B) In-situ (cast-in-place) construction

(C) Slip-form construction

(D) Guniting

Q10. The precast floor unit shown in cross-section, with continuous longitudinal cylindrical voids that cut its self-weight and allow services to pass through, is known as a: [1 mark]



(A) Hollow-core (cored) slab

(B) Waffle slab

(C) Flat plate

(D) Coffered dome

Q11. In a precast concrete frame, a short projecting bracket cast integrally on the face of a column to receive and support the end of a precast beam is called a: **[1 mark]**

(A) Purlin

(B) Mullion

(C) Spandrel

(D) Corbel

Q12. In the PERT technique of project scheduling, the expected duration t_e of an activity is obtained from its optimistic time o, most likely time m and pessimistic time p as: **[1 mark]**

(A) $t_e = \dfrac{o + 4m + p}{6}$

(B) $t_e = \dfrac{o + m + p}{3}$

(C) $t_e = \dfrac{o + p}{2}$

(D) $t_e = \dfrac{o + 4p + m}{6}$

Q13. The prestressing method in which the high-tensile tendons are stretched *before* the concrete is cast around them, and the prestress is later transferred to the hardened concrete purely through bond when the tendons are released, is called: **[1 mark]**

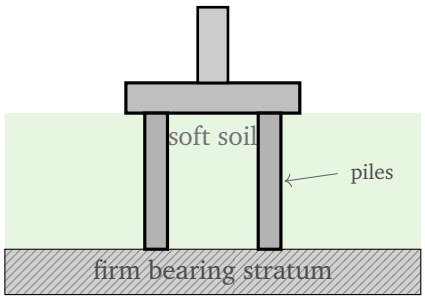
(A) Post-tensioning

(B) Pre-tensioning

(C) Grouting

(D) Shoring

Q14. The foundation shown in section, in which slender members carry the building load down through weak surface soil to a firm bearing stratum well below, is a: **[1 mark]**



(A) Raft (mat) foundation

(B) Pile (deep) foundation

(C) Isolated (spread) footing

(D) Continuous strip footing

Q15. In the "tilt-up" construction technique, large concrete wall panels are first cast flat on the ground (often on the floor slab) and then rotated up into their vertical position. Its chief advantage is: **[1 mark]**

(A) rapid on-site casting of large panels with minimal formwork and fast erection

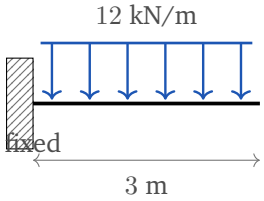
(B) complete elimination of steel reinforcement

(C) removing the need for any foundation

(D) that it works only for doubly-curved shells

Building Structures and Systems

Q16. A cantilever beam of length 3 m carries a uniformly distributed load of 12 kN/m over its entire length, as shown. The magnitude of the bending moment at the fixed support is: **[1 mark]**



(A) 18 kN·m

(B) 36 kN·m

(C) 108 kN·m

(D) 54 kN·m

Q17. The *safe bearing capacity* of a foundation soil is best defined as: **[1 mark]**

(A) the pressure that just causes shear failure of the soil, taken with no factor of safety

(B) the total self-weight of the foundation and the soil above it

(C) the maximum pressure the soil can carry safely without shear failure or excessive settlement, i.e. the ultimate bearing capacity divided by a suitable factor of safety

(D) the weight of water displaced by the foundation

Q18. A slender structural member that is loaded primarily in axial compression, such as a vertical support transferring floor loads down to the foundation, is a: **[1 mark]**

(A) Tie

(B) Beam

(C) Lintel

(D) Column (strut)

Q19. The lateral load on a building whose magnitude depends on the basic wind speed of the region, the terrain category and the height of the structure is classified as the: **[1 mark]**

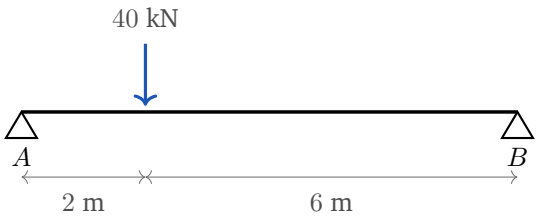
(A) Dead load

(B) Wind load

(C) Prestressing force

(D) Floor finish load

Q20. A simply supported beam AB of span 8 m carries a single point load of 40 kN at 2 m from support A, as shown. The vertical reaction at support A is: **[1 mark]**



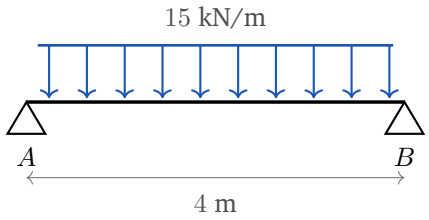
(A) 10 kN

(B) 40 kN

(C) 30 kN

(D) 20 kN

Q21. A simply supported beam of span 4 m carries a uniformly distributed load of 15 kN/m over its entire span, as shown. The maximum bending moment in the beam is: **[2 marks]**



(A) 60 kN·m

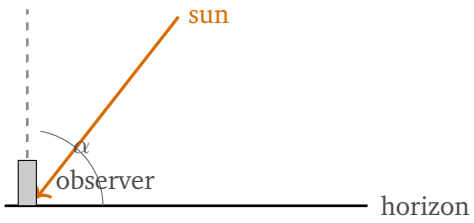
(B) 15 kN·m

(C) 30 kN·m

(D) 7.5 kN·m

Environmental Design and Building Services

Q22. At solar noon the sun's altitude above the horizon is $\alpha = 90^\circ - |\phi - \delta|$, where ϕ is the latitude and δ the solar declination. For a place at latitude 21° N on the summer solstice ($\delta = +23.5^\circ$), the noon solar altitude, as shown, is: **[2 marks]**



(A) 87.5°

(B) 68.5°

(C) 45°

(D) 90°

Q23. Using Sabine's formula $\text{RT}_{60} = \dfrac{0.161\,V}{A}$, an auditorium of volume $V = 1200$ m^3 has a total absorption of $A = 120$ sabins. Its reverberation time is nearest to: **[2 marks]**

(A) 0.80 s

(B) 1.61 s

(C) 3.22 s

(D) 0.40 s

Q24. As per lighting design practice, the recommended maintained illuminance for a drawing office engaged in precise, detailed technical drafting is of the order of: **[2 marks]**

(A) 100 lux

(B) 50 lux

(C) 300 lux

(D) 750 lux

Q25. Heat is lost through an external wall of area 10 m^2 and overall heat-transfer coefficient (U-value) 2.0 W/m^{2}K, with an inside-to-outside temperature difference of 15 K. The steady-state rate of heat flow through the wall is: **[2 marks]**

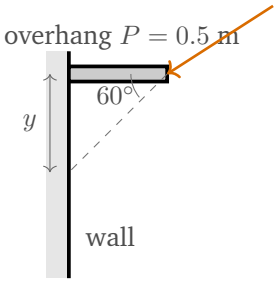
(A) 150 W

(B) 75 W

(C) 300 W

(D) 30 W

Q26. A horizontal overhang of projection $P = 0.5$ m is provided over a window. When the sun is at an altitude angle of 60° in the plane of the section shown, the vertical length y of shadow cast down the wall below the overhang is: **[2 marks]**



(A) 0.87 m

(B) 0.50 m

(C) 0.29 m

(D) 1.00 m

Q27. For human thermal comfort in warm Indian climates, the indoor operative temperature is generally kept within a comfortable band of about: **[2 marks]**

(A) 5–10°C

(B) 40–45°C

(C) 32–38°C

(D) 25–30°C

Q28. In a soil-and-waste (single-stack) plumbing system, the pipe carried up above the highest fixture to keep the drainage pipework at atmospheric pressure and so protect the trap water-seals against siphonage is the: **[2 marks]**

(A) Soil pipe

(B) Vent pipe

(C) Waste pipe

(D) Rainwater downpipe

Urban Design and Landscape Architecture

Q29. Camillo Sitte, in *City Planning According to Artistic Principles* (1889), argued against monotonous mechanical layouts and instead advocated: [2 marks]

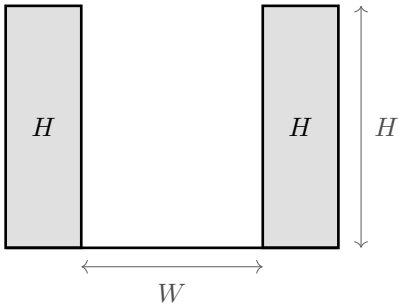
(A) rigid gridiron street plans for maximum efficiency

(B) high-rise towers set in open parkland

(C) the complete functional separation of land uses

(D) irregular, picturesque and enclosed public squares in the spirit of medieval towns

Q30. In the urban street section shown, the ratio of the flanking building height H to the street width W (the "aspect ratio" of the urban canyon) governs enclosure and sunlight. For $H = 24$ m and $W = 12$ m, the aspect ratio H/W is: [2 marks]



(A) 0.5

(B) 2.0

(C) 1.0

(D) 12

Q31. A landscape design approach that selects drought-tolerant plants and water-thrifty layouts so as to minimise or eliminate the need for supplemental irrigation in dry regions is called: [2 marks]

(A) Hardscaping

(B) Softscaping

(C) Greenway planning

(D) Xeriscaping

Q32. A linear open-space corridor – often following a river, ridge or disused rail line – that links parks and natural areas and supports recreation and wildlife movement, is termed a: [2 marks]

(A) Cul-de-sac

(B) Piazza

(C) Boulevard

(D) Greenway

Q33. Ian McHarg, in *Design with Nature* (1969), is chiefly credited with pioneering which site-planning technique? [2 marks]

(A) ecological overlay ("sieve-map") analysis of land suitability

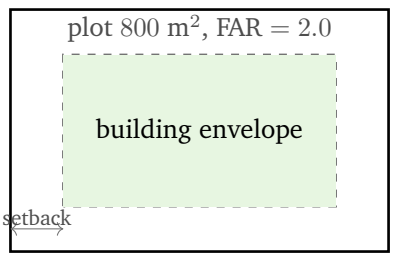
(B) the gridiron subdivision of land

(C) serial-vision townscape sketching

(D) the Radburn superblock layout

Urban and Regional Planning and Housing

Q34. A plot of area 800 m^2 is allowed a Floor Area Ratio (FAR / FSI) of 2.0 within the setback envelope shown. The maximum permissible total built-up (floor) area on the plot is: [2 marks]



(A) 1600 m^2

(B) $400\ \text{m}^2$

(C) $800\ \text{m}^2$

(D) $3200\ \text{m}^2$

Q35. A town's population grew from $40{,}000$ in 2001 to $60{,}000$ in 2011. Using the *arithmetic increase* method of forecasting, the projected population for 2021 is: **[2 marks]**

(A) $90{,}000$

(B) $80{,}000$

(C) $1{,}00{,}000$

(D) $70{,}000$

Q36. A town of present population $50{,}000$ is projected to grow at a constant 20% per decade. Using the *geometric increase* method, its population after two decades is: **[2 marks]**

(A) $60{,}000$

(B) $70{,}000$

(C) $62{,}000$

(D) $72{,}000$

Q37. A statutory body constituted for the planned development of a whole metropolitan region, coordinating the many local authorities within it (for example the MMRDA for Mumbai or the DDA for Delhi), is best described as a: **[2 marks]**

(A) Gram Panchayat

(B) Metropolitan / regional development authority

(C) Cantonment Board

(D) Village cooperative society

Q38. The 74th Constitutional Amendment Act, 1992 is significant for Indian urban planning chiefly because it: **[2 marks]**

(A) gave constitutional status to urban local bodies (municipalities) and mandated District and Metropolitan Planning Committees

(B) created the national highway network

(C) abolished all municipal corporations

(D) fixed a uniform national water tariff

Q39. The vast, continuously urbanised region formed when several neighbouring metropolitan areas grow and coalesce into a single functional belt – described by Jean Gottmann for the Boston–Washington ("BosWash") corridor – is termed a: **[2 marks]**

(A) Conurbation

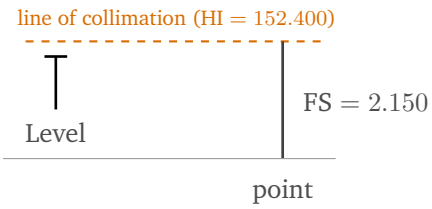
(B) Exurb

(C) Megalopolis

(D) Satellite town

Planning Techniques, Surveying and GIS

Q40. In differential levelling by the height-of-instrument method, the height of instrument (line of collimation) is 152.400 m and a fore sight of 2.150 m is taken on a point, as shown. The reduced level of that point is: **[2 marks]**



(A) 154.550 m

(B) 152.400 m

(C) 150.250 m

(D) 2.150 m

Q41. In a Geographic Information System, the operation of stacking several thematic layers (for example slope, soil and land use) on top of one

another to find the areas that satisfy all the chosen criteria is called: [2 marks]

(A) Geocoding

(B) Overlay analysis

(C) Digitising

(D) Rubber-sheeting

Q42. The *incremental increase* method of population forecasting assumes that: [2 marks]

(A) the population increases by a constant *absolute* amount each decade

(B) the population increases by a constant *percentage* each decade

(C) to the average decadal increase is added the average of the successive increments (increase of the increase), so growth accelerates each decade

(D) the growth follows a logistic (S-shaped) saturation curve

Q43. In remote sensing, the smallest area on the ground that is represented by a single pixel of a satellite image defines the sensor's: [2 marks]

(A) temporal resolution

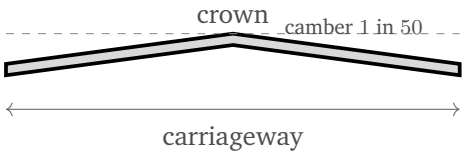
(B) spectral resolution

(C) spatial resolution

(D) radiometric resolution

Infrastructure, Services and Transportation Planning

Q44. The camber (transverse surface slope) of a bituminous carriageway is specified as "1 in 50", as indicated in the cross-section. Expressed as a percentage, this camber is: [2 marks]



(A) 5%

(B) 0.5%

(C) 1%

(D) 2%

Q45. In sewage and effluent characterisation, the Biochemical Oxygen Demand (BOD) is a measure of: [2 marks]

(A) the total dissolved solids in the water

(B) the amount of oxygen consumed by micro-organisms while decomposing the organic matter in the water

(C) the pH (acidity or alkalinity) of the effluent

(D) the turbidity of the water only

Q46. In the classical four-stage (four-step) urban transportation planning model, the stage that allocates the trips among the competing travel modes – private car, bus, metro, walk – is called: [2 marks]

(A) Trip generation

(B) Trip distribution

(C) Modal split

(D) Traffic assignment

Detailed Solutions

Q1.

Solution

Concept – authors of iconic contemporary buildings: Late-20th and early-21st century landmarks are read from their signature formal language and the architect behind it.

Step 1 – read the key features: Continuous, seamless, curving surfaces with no columns and no sharp joints, so that wall, roof and plaza flow into one another.

Step 2 – match to the architect: This fluid, "parametric" vocabulary is the hallmark of **Zaha Hadid**, and the Heydar Aliyev Center in Baku is one of her best-known works.

Why the other options are wrong:

- Rem Koolhaas (OMA) works with bold programmatic diagrams and stacked volumes, not seamless curves.
- Frank Gehry uses crumpled, faceted metal surfaces, a different idiom.
- Daniel Libeskind uses sharp angular shards and voids, not flowing surfaces.

Final Answer: Zaha Hadid $\Rightarrow$ $\boxed{C}$

Answer: (C) Go Back to Q1

Q2.

Solution

Concept – Deconstructivism and its buildings: Deconstructivist works fragment form and reject the pure right angle.

Step 1 – identify the building: The Guggenheim Bilbao is a cluster of writhing, titanium-clad volumes and is one of the most influential buildings of the 1990s.

Step 2 – name the architect: Its author is **Frank Gehry**, whose crumpled metal surfaces (developed with CATIA software) are unmistakable.

Why the other options are wrong:

- Rem Koolhaas designed the CCTV Headquarters, not Bilbao.
- Peter Eisenman is a theorist-architect of the Wexner Center, a different work.
- Bernard Tschumi designed the Parc de la Villette follies.

Final Answer: Frank Gehry $\Rightarrow$ $\boxed{A}$

Answer: (A) Go Back to Q2

Q3.

Solution

Concept – how Deconstructivism was named and launched: An architectural movement is often crystallised by a defining exhibition.

Step 1 – recall the 1988 MoMA show: The exhibition "Deconstructivist Architecture" at the Museum of Modern Art, New York, in 1988 gathered work by Gehry, Hadid, Koolhaas, Eisenman, Libeskind, Tschumi and Coop Himmelb(l)au.

Step 2 – name the curator: It was curated by **Philip Johnson** (with Mark Wigley), the same critic-architect who had earlier co-defined the International Style in 1932.

Why the other options are wrong:

- Louis Sullivan was a 19th-century Chicago School pioneer ("form follows function").
- Kenneth Frampton is the historian of Critical Regionalism.
- Reyner Banham was a historian of the machine age and Modernism.

Final Answer: Philip Johnson $\Rightarrow$ C

Answer: (C) Go Back to Q3

Q4.

Solution

Concept – reading a building from its structural diagram: Some contemporary towers are organised as a single looped structural figure.

Step 1 – describe the form: Two leaning towers rise and are bridged by cantilevered horizontal arms at top and bottom to make a continuous three-dimensional loop (a "Z" in space).

Step 2 – name the designer: This is the CCTV Headquarters in Beijing, designed by the Office for Metropolitan Architecture (OMA) led by **Rem Koolhaas** (with Ole Scheeren).

Why the other options are wrong:

- Zaha Hadid designed the nearby Galaxy SOHO, not the CCTV loop.
- Norman Foster is known for high-tech works such as the Gherkin.

- Renzo Piano designed The Shard and the Pompidou (with Rogers).

Final Answer: Rem Koolhaas $\Rightarrow$ B

Answer: (B) Go Back to Q4

Q5.

Solution

Concept – key theoretical texts of contemporary architecture: Several architects are also influential writers.

Step 1 – recall the book: *Delirious New York* (1978) reads Manhattan's skyscraper culture as a spontaneous urban experiment and coins the phrase "culture of congestion".

Step 2 – name the author: It was written by **Rem Koolhaas**, who called it a "retroactive manifesto".

Why the other options are wrong:

- Robert Venturi wrote *Complexity and Contradiction in Architecture* (1966).
- Aldo Rossi wrote *The Architecture of the City*.
- Charles Jencks wrote *The Language of Post-Modern Architecture*.

Final Answer: Rem Koolhaas $\Rightarrow$ A

Answer: (A) Go Back to Q5

Q6.

Solution

Concept – Postmodern reaction against orthodox Modernism: Postmodernists challenged the austere Modernist creed with wit and complexity.

Step 1 – recall Mies's slogan: Mies van der Rohe championed spare, minimal architecture with "Less is more".

Step 2 – recall the retort: Robert Venturi answered "Less is a bore", arguing for richness, ambiguity and reference in place of bare minimalism.

Why the other options are wrong:

- Philip Johnson turned to Postmodernism (AT&T Building) but did not coin this phrase.

- Le Corbusier and Walter Gropius were Modern-Movement pioneers, not the source of this Postmodern quip.

Final Answer: Robert Venturi $\Rightarrow$ A

Answer: (A) Go Back to Q6

Q7.

Solution

Concept – ordering principles of composition: Standard principles include axis, symmetry, hierarchy, datum, rhythm and transformation.

Step 1 – read the arrangement: A single element is repeated but each copy grows steadily in height, producing a directional, graduated sequence.

Step 2 – name the principle: Repetition with a regulated, progressive change is **rhythm**, here a rhythm by gradation, which carries the eye along the series.

Why the other options are wrong:

- Symmetry is a mirror-balance about an axis, not a graded progression.
- A datum is a continuous line, plane or volume that gathers other elements; it is not the graded repetition itself.
- Contrast relies on abrupt difference, not smooth gradation of a repeated unit.

Final Answer: Rhythm (gradation) $\Rightarrow$ D

Answer: (D) Go Back to Q7

Q8.

Solution

Concept – classifying a building by movement: The idiom is read from its formal strategy.

Step 1 – read the features: A jagged lightning-bolt (zig-zag) plan, cut through by straight "voids", with sharply raking walls and slot windows.

Step 2 – name the movement: This fractured, dislocated geometry is **Deconstructivism**; the Jewish Museum, Berlin, by Daniel Libeskind is a canonical example.

Why the other options are wrong:

- Art Nouveau uses flowing organic ornament (Horta, Gaudi), not angular fragmentation.
- Brutalism is defined by raw exposed concrete masses, a different aesthetic.
- Neoclassicism revives symmetrical classical orders, the opposite of this fractured form.

Final Answer: Deconstructivism $\Rightarrow$ B

Answer: (B) Go Back to Q8

Q9.

Solution

Concept – factory-made versus site-cast construction: Concrete building elements can be produced off-site or poured in place.

Step 1 – describe the method: When members are cast and cured in a controlled yard or factory and then only lifted into position and jointed on site, the load-bearing units are made under better quality control and faster.

Step 2 – name it: This is **prefabrication (precast construction)**. It speeds up erection, reduces site formwork and improves finish and dimensional accuracy.

Why the other options are wrong:

- In-situ construction pours the concrete in its final location on site, the opposite of precasting.
- Slip-form is a moving-formwork method for continuous in-situ casting (silos, cores).
- Guniting is spraying mortar under pressure for repair or lining, not a framing method.

Final Answer: Prefabrication (precast construction) $\Rightarrow$ A

Answer: (A) Go Back to Q9

Q10.

Solution

Concept – naming a precast floor unit from its section: Precast floors differ in how they lighten the slab.

Step 1 – read the section: A solid rectangular precast unit with continuous circular tubes running lengthwise through it.

Step 2 – name it: This is a **hollow-core (cored) slab**. The tubular voids remove concrete where it is least needed, cutting self-weight while leaving room for services; the units are usually prestressed and span long distances without propping.

Why the other options are wrong:

- A waffle slab is an in-situ two-way ribbed slab with a grid of square coffers, not a precast plank with round tubes.
- A flat plate is a solid slab of uniform thickness bearing directly on columns, with no voids.
- A coffered dome is a curved ceiling with recessed panels, unrelated to a floor plank.

Final Answer: Hollow-core (cored) slab $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q10

Q11.

Solution

Concept – precast frame connection details: Precast beams must be seated on the columns during erection.

Step 1 – describe the detail: A short load-bearing shelf or bracket is cast projecting from the column face; the precast beam end rests on it while the joint is completed.

Step 2 – name it: Such a projecting bracket is a **corbel** (also called a nib or haunch). It is designed for the vertical beam reaction and the horizontal force from restrained shrinkage/creep.

Why the other options are wrong:

- A purlin is a roof member carrying sheeting between trusses.
- A mullion is a vertical divider between window panes.
- A spandrel is the wall/beam element between the head of one window and the sill of the one above; it is not the support bracket.

Final Answer: Corbel $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q11

Q12.

Solution

Concept – expected activity time in PERT: PERT treats each activity duration as uncertain and uses three time estimates.

Step 1 – list the three estimates: Optimistic o (best case), most likely m (modal), pessimistic p (worst case).

Step 2 – apply the beta-distribution weighting: The most likely value is given four times the weight of the two extremes: $t_e = \dfrac{o + 4m + p}{6}$.

Step 3 – interpret: The denominator $6 = 1 + 4 + 1$ is the sum of the weights, so t_e is a weighted mean biased towards m.

Why the other options are wrong:

- $(o + m + p)/3$ is a plain average that ignores the extra weight on m.
- $(o + p)/2$ uses only the extremes.
- $(o+4p+m)/6$ wrongly weights the pessimistic time instead of the most likely.

Final Answer: $t_e = \dfrac{o + 4m + p}{6} \Rightarrow \boxed{\text{A}}$

Answer: (A) Go Back to Q12

Q13.

Solution

Concept – the two ways of prestressing concrete: The prestress can be applied before or after the concrete hardens.

Step 1 – describe the method in the question: Tendons are tensioned first, against external abutments; the concrete is cast around the stretched tendons and allowed to harden; then the tendons are cut, and as they try to shorten they compress the concrete through *bond*.

Step 2 – name it: Because the tendons are stressed *before* casting, this is **pre-tensioning**. It suits factory production of standard units such as sleepers, poles and hollow-core planks.

Why the other options are wrong:

- In post-tensioning the concrete is cast first with ducts, and the tendons are stressed and anchored *after* it hardens.
- Grouting merely fills the ducts around post-tensioned tendons.
- Shoring is temporary propping during construction, not a prestressing

method.

Final Answer: Pre-tensioning $\Rightarrow$ B

Answer: (B) Go Back to Q13

Q14.

Solution

Concept – shallow versus deep foundations: The foundation type depends on where the load is finally carried.

Step 1 – read the section: Slender vertical members pass through the weak surface soil and reach a firm stratum well below, with a cap tying them to the column.

Step 2 – name it: This is a **pile (deep) foundation**. Piles carry load by end bearing on the firm stratum and by skin friction along their length, and are used when surface soil is too weak or compressible for a shallow footing.

Why the other options are wrong:

- A raft is a shallow slab spread over the whole plan at the surface, not deep members.
- An isolated footing is a shallow pad under a single column near the surface.
- A strip footing is a shallow continuous footing under a wall or a row of columns.

Final Answer: Pile (deep) foundation $\Rightarrow$ B

Answer: (B) Go Back to Q14

Q15.

Solution

Concept – the tilt-up precast technique: Tilt-up is a form of on-site precasting for wall panels.

Step 1 – describe the sequence: Full-storey wall panels are cast flat (horizontally) on the ground or on the completed floor slab, cured, and then lifted by crane and rotated up into their vertical position before being braced and connected.

Step 2 – state the advantage: Because casting is done flat on a ready surface, the method allows **rapid casting of very large panels with minimal formwork and quick erection**, saving time and cost on suitable low- and mid-rise buildings.

Why the other options are wrong:

- The panels are still reinforced (and often carry lifting inserts), so reinforcement is not eliminated.
- A foundation is still required to receive the panels.
- Tilt-up is used for flat (planar) panels, not doubly-curved shells.

Final Answer: rapid casting of large panels with minimal formwork $\Rightarrow$ A

Answer: (A) Go Back to Q15

Q16.

Solution

Concept – fixing moment of a cantilever under a UDL: For a cantilever with a uniformly distributed load, the maximum moment occurs at the fixed end.

Step 1 – list the data: Intensity $w = 12$ kN/m; length $L = 3$ m.

Step 2 – find the total load: Total load $W = w \times L = 12 \times 3 = 36$ kN.

Step 3 – locate its resultant: The UDL acts at the centroid of the load, i.e. at $L/2 = 1.5$ m from the fixed end.

Step 4 – take the moment about the fixed support: $M = W \times \dfrac{L}{2} = 36 \times 1.5 = 54$ kN·m.

Step 5 – confirm with the standard formula: $M = \dfrac{wL^2}{2} = \dfrac{12 \times 3^2}{2} = \dfrac{12 \times 9}{2} = \dfrac{108}{2} = 54$ kN·m (hogging).

Why the other options are wrong:

- 18 and 36 kN·m use a wrong lever arm.
- 108 kN·m forgets to divide by 2 (it is wL^2, not $wL^2/2$).

Final Answer: $M = 54$ kN·m $\Rightarrow$ D

Answer: (D) Go Back to Q16

Q17.

Solution

Concept – ultimate versus safe bearing capacity: Foundation design must limit both shear failure and settlement of the soil.

Step 1 – define ultimate bearing capacity: The ultimate bearing capacity is the intensity of pressure at which the soil fails in shear beneath the foundation.

Step 2 – introduce the factor of safety: Dividing the ultimate value by a factor of safety (commonly 2 to 3) gives the pressure the soil can carry with a margin against failure.

Step 3 – state the safe bearing capacity: The **safe bearing capacity** is therefore the maximum pressure the soil can carry safely without shear failure or excessive settlement – the smaller of the shear-controlled and settlement-controlled allowable values.

Why the other options are wrong:

- Option A describes the ultimate (not safe) capacity, with no factor of safety.
- The self-weight of the foundation and the displaced water are unrelated definitions.

Final Answer: safe pressure without failure or excessive settlement $\Rightarrow$ C

Answer: (C) Go Back to Q17

Q18.

Solution

Concept – naming a member by its dominant internal force: Members are classified by whether they carry axial force, bending or both.

Step 1 – read the description: A slender vertical member that mainly carries axial compression and passes floor loads down to the foundation.

Step 2 – name it: This is a **column** (a compression member is also called a strut). It transfers load axially from beams and slabs to the footing.

Why the other options are wrong:

- A tie carries axial *tension*, not compression.
- A beam carries transverse load mainly in bending.
- A lintel is a small beam spanning over an opening, again a bending member.

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

Answer: (D) Go Back to Q18

Q19.

Solution

Concept – classifying environmental loads: Loads on a building are grouped as gravity (dead, live) and environmental (wind, seismic).

Step 1 – read the description: A lateral load whose size depends on the regional basic wind speed, the terrain category and the height of the structure.

Step 2 – name it: This is the **wind load**, computed in India from IS 875 (Part 3) using the design wind pressure $p_z = 0.6\,V_z^2$.

Why the other options are wrong:

- Dead load is the fixed self-weight and does not depend on wind speed or terrain.
- A prestressing force is an internal force deliberately introduced in a member, not an external load.
- Floor-finish load is a part of the dead load, again unrelated to wind speed.

Final Answer: Wind load $\Rightarrow$ B

Answer: (B) Go Back to Q19

Q20.

Solution

Concept – support reactions by taking moments: For a simply supported beam, the reactions are found from equilibrium.

Step 1 – list the data: Span $L = 8$ m; load $W = 40$ kN acting at $a = 2$ m from A (so 6 m from B).

Step 2 – take moments about B (clockwise positive): $R_A \times 8 = 40 \times (8 - 2)$

Step 3 – compute the right-hand side: $40 \times 6 = 240$

Step 4 – solve for R_A: $R_A = \dfrac{240}{8} = 30$ kN.

Step 5 – check with vertical equilibrium: $R_B = 40 - 30 = 10$ kN, and $R_A > R_B$ is expected because the load sits nearer A.

Why the other options are wrong:

- 10 kN is R_B, the far reaction, not R_A.

- 40 kN is the whole load, ignoring the split between supports.
- 20 kN would apply only if the load were at midspan.

Final Answer: $R_A = 30$ kN $\Rightarrow$ C

Answer: (C) Go Back to Q20

Q21.

Solution

Concept – maximum moment for a simply supported beam under a full UDL: $M_{\max} = \dfrac{wL^2}{8}$, occurring at midspan.

Step 1 – list the data: $w = 15$ kN/m; span $L = 4$ m.

Step 2 – find the support reactions: Total load $= wL = 15 \times 4 = 60$ kN; by symmetry $R_A = R_B = 30$ kN.

Step 3 – compute wL^2: $wL^2 = 15 \times 4^2 = 15 \times 16 = 240$.

Step 4 – divide by 8: $M_{\max} = \dfrac{240}{8} = 30$ kN·m.

Step 5 – interpret: The maximum sagging moment of 30 kN·m is at midspan, where the shear force is zero.

Why the other options are wrong:

- 60 kN·m uses $wL^2/4$, appropriate to a central point load, not a UDL.
- 15 kN·m and 7.5 kN·m divide by too large a factor.

Final Answer: $M_{\max} = 30$ kN·m $\Rightarrow$ C

Answer: (C) Go Back to Q21

Q22.

Solution

Concept – noon solar altitude with declination: On any day the noon altitude is measured from the horizon using latitude and declination.

Step 1 – write the relation: $\alpha = 90^\circ - |\phi - \delta|$.

Step 2 – substitute the values: $\phi = 21^\circ$, $\delta = +23.5^\circ$, so $\alpha = 90^\circ - |21^\circ - 23.5^\circ|$.

Step 3 – evaluate the difference: $|21^\circ - 23.5^\circ| = 2.5^\circ$.

Step 4 – complete the calculation: $\alpha = 90^\circ - 2.5^\circ = 87.5^\circ$.

Step 5 – interpret: The noon sun is almost overhead (only 2.5° from the vertical),

because on the summer solstice the sub-solar point at 23.5° N is very close to this latitude.

Why the other options are wrong:

- 68.5° would be the equinox altitude ($90 - 21.5$, roughly) with no declination added.
- 45° corresponds to no particular given data.
- 90° would need $\phi = \delta$ exactly, i.e. the sun truly overhead.

Final Answer: $\alpha = 87.5^\circ \Rightarrow$ A

Answer: (A) Go Back to Q22

Q23.

Solution

Concept – Sabine's reverberation-time formula: $\text{RT}_{60} = \dfrac{0.161\,V}{A}$ with V in m^3 and A in metric sabins.

Step 1 – list the data: $V = 1200\ \text{m}^3$, $A = 120$ sabins.

Step 2 – compute the numerator: $0.161 \times 1200 = 193.2$.

Step 3 – divide by the absorption: $\text{RT}_{60} = \dfrac{193.2}{120}$.

Step 4 – evaluate: $\text{RT}_{60} = 1.61$ s.

Why the other options are wrong:

- 0.80 s and 0.40 s would need far greater absorption.
- 3.22 s is double the correct value (as if $A = 60$ sabins).

Final Answer: $\text{RT}_{60} \approx 1.61$ s $\Rightarrow$ B

Answer: (B) Go Back to Q23

Q24.

Solution

Concept – illuminance for fine visual tasks: The finer and more sustained the task, the higher the required lux.

Step 1 – recall the value for drafting: Precise technical drawing in a drawing office calls for a high maintained illuminance of about **750 lux** (values of 750–1000

lux are typical for such detailed work).

Step 2 – place it on the scale: This is well above general office reading ($\sim$300–500 lux) and far above circulation ($\sim$100–150 lux), because drawing demands the resolution of very fine lines.

Why the other options are wrong:

- 100 lux and 50 lux suit corridors or storage, far too dim for drafting.
- 300 lux is adequate only for routine reading and writing, not for precise drawing.

Final Answer: 750 lux $\Rightarrow$ D

Answer: (D) Go Back to Q24

Q25.

Solution

Concept – steady-state heat flow through a wall: The conduction/overall heat loss is $Q = U\,A\,\Delta T$.

Step 1 – list the data: $U = 2.0$ W/m^{2}K, $A = 10$ m^2, $\Delta T = 15$ K.

Step 2 – write the equation: $Q = U \times A \times \Delta T$.

Step 3 – multiply U and A: $2.0 \times 10 = 20$ W/K.

Step 4 – multiply by the temperature difference: $Q = 20 \times 15 = 300$ W.

Why the other options are wrong:

- 150 W halves the correct value (as if $U = 1.0$).
- 75 W and 30 W drop one of the three factors.

Final Answer: $Q = 300$ W $\Rightarrow$ C

Answer: (C) Go Back to Q25

Q26.

Solution

Concept – shadow cast by a horizontal overhang: For a section in the plane of the sun, the vertical shadow drop relates the overhang projection to the solar altitude.

Step 1 – draw the geometry: The sun ray grazes the outer edge of the overhang

at altitude angle α above the horizontal and strikes the wall a distance y below the overhang.

Step 2 – write the trigonometric relation: $\tan\alpha = \dfrac{y}{P}$, so $y = P\,\tan\alpha$.

Step 3 – substitute the values: $P = 0.5$ m, $\alpha = 60^\circ$, and $\tan 60^\circ = 1.732$.

Step 4 – evaluate: $y = 0.5 \times 1.732 = 0.866 \approx 0.87$ m.

Step 5 – interpret: A 0.5 m overhang shades about 0.87 m of wall below it when the sun is high (60°).

Why the other options are wrong:

- 0.50 m simply repeats the projection (as if $\tan\alpha = 1$, i.e. $\alpha = 45^\circ$).
- 0.29 m uses $P/\tan\alpha$ instead of $P\tan\alpha$.
- 1.00 m rounds up without the trigonometry.

Final Answer: $y \approx 0.87$ m $\Rightarrow$ A

Answer: (A) Go Back to Q26

Q27.

Solution

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

Step 1 – recall the comfort range: For warm Indian climates the comfortable indoor operative temperature is generally taken as about **25–30°C** (adaptive comfort allows the upper end with air movement).

Step 2 – reason physiologically: Below this the body loses heat too fast; above it, sweating and discomfort set in, so the comfort zone sits a little above room-neutral.

Why the other options are wrong:

- 5–10°C is cold and uncomfortable.
- 40–45°C and 32–38°C are hot, causing heat stress rather than comfort.

Final Answer: 25–30°C $\Rightarrow$ D

Answer: (D) Go Back to Q27

Q28.

Solution

Concept – protecting trap seals in drainage: A drainage stack must stay near atmospheric pressure or the water seals will be sucked or blown out.

Step 1 – describe the pipe: A pipe is carried up past the highest fixture and open to the air; it lets air in and out so that discharging water does not create the pressure swings that would siphon the traps.

Step 2 – name it: This is the **vent pipe**. By keeping the system at atmospheric pressure it preserves the water seals in the traps and lets foul gases escape safely above roof level.

Why the other options are wrong:

- A soil pipe carries the discharge from water closets; it is a waste-carrying, not an air-relief, pipe.
- A waste pipe carries used water from basins, sinks and baths, again a discharge pipe.
- A rainwater downpipe carries roof runoff and is not part of the trap-venting system.

Final Answer: Vent pipe $\Rightarrow$ B

Answer: (B) Go Back to Q28

Q29.

Solution

Concept – Camillo Sitte's artistic city planning: Sitte reacted against the sweeping, mechanical boulevards of 19th-century replanning.

Step 1 – recall his argument: Studying the squares of old European towns, Sitte praised their enclosure, irregularity and picturesque grouping of buildings around a well-defined public space.

Step 2 – state his advocacy: He advocated **irregular, enclosed, picturesque public squares** designed by "artistic principles", with monuments placed to the side rather than in the middle.

Why the other options are wrong:

- A rigid gridiron is exactly the mechanical layout Sitte criticised.
- High-rise towers in parkland is Le Corbusier's Radiant City, the opposite ideal.

- Total separation of uses is a later functionalist (CIAM) doctrine, not Sitte's.

Final Answer: picturesque, enclosed public squares $\Rightarrow$ D

Answer: (D) Go Back to Q29

Q30.

Solution

Concept – the aspect ratio of an urban "canyon": The enclosure and sunlight of a street depend on the ratio of building height to street width.

Step 1 – write the ratio: Aspect ratio $= \dfrac{H}{W}$.

Step 2 – list the data: $H = 24$ m, $W = 12$ m.

Step 3 – substitute: $\dfrac{H}{W} = \dfrac{24}{12}$.

Step 4 – evaluate: $\dfrac{H}{W} = 2.0$.

Step 5 – interpret: An aspect ratio of 2.0 is a fairly deep, strongly enclosed canyon that limits direct sunlight and sky view at street level.

Why the other options are wrong:

- 0.5 inverts the ratio (W/H).
- 1.0 would need $H = W$.
- 12 merely repeats the width.

Final Answer: $H/W = 2.0 \Rightarrow$ B

Answer: (B) Go Back to Q30

Q31.

Solution

Concept – water-wise planting: Landscape approaches differ in how much irrigation they demand.

Step 1 – describe the approach: Selecting drought-tolerant, often native plants, grouping them by water need, mulching and reducing lawn, so as to cut or remove supplemental watering.

Step 2 – name it: This is **xeriscaping** (from Greek *xeros*, dry), a design strategy for arid and semi-arid regions.

Why the other options are wrong:

- Hardscaping is the constructed, non-living element (paving, walls), not a planting strategy.
- Softscaping simply means the living plant material in general.
- A greenway is a linear open-space corridor, not a water-conservation method.

Final Answer: Xeriscaping $\Rightarrow$ D

Answer: (D) Go Back to Q31

Q32.

Solution

Concept – linear open-space corridors: Open spaces may be points, areas or linear links.

Step 1 – describe the element: A linear strip of protected open land, often along a river, ridge or old rail alignment, that connects parks and habitats and carries walking and cycling routes.

Step 2 – name it: This is a **greenway**, which serves recreation, non-motorised movement and ecological connectivity together.

Why the other options are wrong:

- A cul-de-sac is a dead-end residential street, not an open-space corridor.
- A piazza is a single enclosed urban square (a point, not a linear link).
- A boulevard is a wide tree-lined *traffic* avenue, not a protected green corridor for wildlife and recreation.

Final Answer: Greenway $\Rightarrow$ D

Answer: (D) Go Back to Q32

Q33.

Solution

Concept – Ian McHarg and ecological planning: McHarg brought an ecological, data-driven method to site and regional planning.

Step 1 – recall the method: In *Design with Nature* he mapped each environmental factor (slope, soils, hydrology, vegetation, wildlife, scenery) on a separate transparent layer, shading the least suitable land darkest.

Step 2 – describe the overlay: Superimposing the layers made the composite

"sieve map": where the stack is lightest, land is most suitable for development; where darkest, it is least suitable.

Step 3 – name it: This **ecological overlay (sieve-map) analysis** of land suitability is McHarg's central contribution and a conceptual forerunner of GIS overlay.

Why the other options are wrong:

- The gridiron subdivision is an old survey/layout device, not McHarg's method.
- Serial vision is Gordon Cullen's townscape idea.
- The Radburn superblock is Stein and Wright's residential layout.

Final Answer: ecological overlay (sieve-map) analysis $\Rightarrow$ A

Answer: (A) Go Back to Q33

Q34.

Solution

Concept – Floor Area Ratio (FAR / FSI): FAR is the ratio of total built-up floor area to plot area: $\text{FAR} = \dfrac{\text{total floor area}}{\text{plot area}}$.

Step 1 – rearrange for floor area: Total floor area $=$ FAR $\times$ plot area.

Step 2 – list the data: Plot area $= 800\ \text{m}^2$, FAR $= 2.0$.

Step 3 – substitute: Total floor area $= 2.0 \times 800$.

Step 4 – evaluate: Total floor area $= 1600\ \text{m}^2$.

Step 5 – interpret: The $1600\ \text{m}^2$ can be spread over several floors within the setback envelope (for example four floors of $400\ \text{m}^2$), but the total is capped at $1600\ \text{m}^2$.

Why the other options are wrong:

- $400\ \text{m}^2$ divides by FAR instead of multiplying.
- $800\ \text{m}^2$ is the plot area (FAR $= 1$).
- $3200\ \text{m}^2$ uses FAR $= 4$.

Final Answer: $1600\ \text{m}^2 \Rightarrow$ A

Answer: (A) Go Back to Q34

Q35.

Solution

Concept – the arithmetic increase method of population forecasting: This method assumes a constant *absolute* increase in population each decade.

Step 1 – find the decadal increment: Increment per decade $= 60{,}000 - 40{,}000 = 20{,}000$.

Step 2 – state the assumption: Under the arithmetic method the same absolute increment $(20{,}000)$ is added in every future decade.

Step 3 – project to 2021: $P_{2021} = P_{2011} + \text{increment} = 60{,}000 + 20{,}000$.

Step 4 – evaluate: $P_{2021} = 80{,}000$.

Why the other options are wrong:

- $90{,}000$ and $1{,}00{,}000$ correspond to larger (geometric or over-estimated) increments.
- $70{,}000$ adds only half the observed increment.

Final Answer: $80{,}000 \Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q35

Q36.

Solution

Concept – the geometric increase method of population forecasting: This method assumes a constant *percentage* growth each decade, i.e. compound growth $P_n = P_0(1+r)^n$.

Step 1 – list the data: Present population $P_0 = 50{,}000$; decadal growth rate $r = 20\% = 0.20$; number of decades $n = 2$.

Step 2 – write the growth factor: $(1 + r) = 1.20$.

Step 3 – raise it to the number of decades: $(1.20)^2 = 1.44$.

Step 4 – multiply by the present population: $P_2 = 50{,}000 \times 1.44$.

Step 5 – evaluate: $P_2 = 72{,}000$.

Why the other options are wrong:

- $60{,}000$ applies the 20% growth for only one decade.
- $70{,}000$ wrongly adds 20% twice arithmetically $(10{,}000 + 10{,}000)$ instead of compounding.

- $62{,}000$ does not follow from the compound calculation.

Final Answer: $72{,}000 \Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q36

Q37.

Solution

Concept – metropolitan governance in India: Large city regions cross many municipal boundaries and need a coordinating body.

Step 1 – describe the body: A statutory authority set up under a town-planning or development act to prepare and enforce the plan for a whole metropolitan region, coordinating the many local bodies within it.

Step 2 – name it: This is a **metropolitan / regional development authority**, such as the MMRDA (Mumbai) or the DDA (Delhi), which handle regional planning, land development and major infrastructure.

Why the other options are wrong:

- A Gram Panchayat is the local self-government of a single village.
- A Cantonment Board administers a military cantonment area, not a metropolitan region.
- A village cooperative society is an economic body, not a planning authority.

Final Answer: Metropolitan / regional development authority $\Rightarrow \boxed{\text{B}}$

Answer: (B) Go Back to Q37

Q38.

Solution

Concept – the 74th Constitutional Amendment Act, 1992: This amendment reshaped urban local governance in India.

Step 1 – recall its purpose: It gave **constitutional status to urban local bodies** (municipalities), inserting Part IX-A and the Twelfth Schedule, and required regular elections, State Finance Commissions and reservation of seats.

Step 2 – note the planning provisions: It also mandated **District Planning Committees** and **Metropolitan Planning Committees** to prepare integrated development plans, directly strengthening statutory urban and regional planning.

Why the other options are wrong:

- The national highway network is unrelated to this amendment.
- Municipal corporations were empowered, not abolished.
- Water tariffs are a local/state matter, not fixed by this amendment.

Final Answer: constitutional status to municipalities and mandated planning committees $\Rightarrow$ A

Answer: (A) Go Back to Q38

Q39.

Solution

Concept – the largest scale of urban coalescence: As cities grow, neighbouring metropolitan areas can merge into a single belt.

Step 1 – describe the phenomenon: Several metropolitan regions expand until their built-up areas and economies fuse into one continuous, polynuclear urban belt.

Step 2 – name it: Jean Gottmann called such a belt a **megalopolis**, using the Boston–New York–Philadelphia–Baltimore–Washington ("BosWash") corridor as his example.

Why the other options are wrong:

- A conurbation (Geddes) is the merging of smaller neighbouring *towns*, a smaller scale than a fused belt of metropolises; the BosWash example is specifically Gottmann's megalopolis.
- An exurb is a prosperous settlement beyond the suburbs, not a merged region.
- A satellite town is a smaller planned town dependent on a parent city, again the opposite scale.

Final Answer: Megalopolis $\Rightarrow$ C

Answer: (C) Go Back to Q39

Q40.

Solution

Concept – reduced level from a fore sight (HI method): In the height-of-instrument method, a fore sight is subtracted from the height of instrument.

Step 1 – write the relation: RL of point $=$ HI $-$ fore sight.

Step 2 – list the data: HI $= 152.400$ m; FS $= 2.150$ m.

Step 3 – substitute: RL $= 152.400 - 2.150$.

Step 4 – evaluate: RL $= 150.250$ m.

Step 5 – interpret: The staff reading is subtracted because a larger fore sight means the ground is lower relative to the line of collimation.

Why the other options are wrong:

- 154.550 m *adds* the fore sight, which is the operation for a back sight, not a fore sight.
- 152.400 m ignores the fore sight altogether.
- 2.150 m is merely the staff reading, not a reduced level.

Final Answer: RL $= 150.250$ m $\Rightarrow$ C

Answer: (C) Go Back to Q40

Q41.

Solution

Concept – combining thematic layers in a GIS: A core GIS operation is to combine several spatial layers to answer a multi-criteria question.

Step 1 – describe the operation: Layers such as slope, soil and land use are geometrically superimposed so that, at every location, the values from all layers are read together and combined by rules.

Step 2 – name it: This is **overlay analysis**. It identifies the zones that meet all the required conditions (for example gentle slope AND stable soil AND permitted use).

Why the other options are wrong:

- Geocoding converts addresses into map coordinates.
- Digitising is tracing features from a source map into vector form.
- Rubber-sheeting is a geometric warping used to register a layer to control points.

Final Answer: Overlay analysis $\Rightarrow$ B

Answer: (B) Go Back to Q41

Q42.

Solution

Concept – the incremental increase method of forecasting: This method refines the arithmetic method by accounting for the change in the increment itself.

Step 1 – recall the arithmetic method: The arithmetic method adds a constant absolute increment each decade.

Step 2 – add the "increase of the increase": The incremental increase method notes that the decadal increment usually grows, so it adds the average decadal increase *plus* the average of the successive increments (the second difference) to each future decade.

Step 3 – state the assumption: Growth therefore *accelerates*: each decade's addition is larger than the last. This suits towns in a growing phase.

Why the other options are wrong:

- A constant absolute increment is the plain arithmetic method.
- A constant percentage each decade is the geometric method.
- A logistic saturation curve is the logistic (S-curve) method for a town nearing its saturation population.

Final Answer: average increase plus the average increment added each decade $\Rightarrow$ C

Answer: (C) Go Back to Q42

Q43.

Solution

Concept – resolutions of a remote-sensing sensor: A sensor is described by several kinds of resolution.

Step 1 – define the ground area per pixel: The size of the smallest ground area captured by one pixel is the sensor's **spatial resolution** (for example a 10 m or 30 m pixel).

Step 2 – contrast the others: Spectral resolution is the number and narrowness of wavelength bands; temporal resolution is how often the same place is revisited;

radiometric resolution is the number of brightness levels recorded.

Why the other options are wrong:

- Temporal resolution concerns revisit *time*, not ground area.
- Spectral resolution concerns *wavelength* bands.
- Radiometric resolution concerns the range of *brightness* values.

Final Answer: spatial resolution $\Rightarrow$ C

Answer: (C) Go Back to Q43

Q44.

Solution

Concept – expressing camber as a percentage: Camber given as a ratio "1 in n" is converted to a percentage by dividing and multiplying by 100.

Step 1 – write the ratio as a fraction: $1 \text{ in } 50 = \frac{1}{50}$.

Step 2 – evaluate the fraction: $\frac{1}{50} = 0.02$.

Step 3 – convert to a percentage: $0.02 \times 100 = 2\%$.

Step 4 – interpret: The road surface falls 2 cm for every 100 cm (1 m) measured across it, draining rainwater to the sides.

Why the other options are wrong:

- 5% corresponds to 1 in 20.
- 1% corresponds to 1 in 100.
- 0.5% corresponds to 1 in 200.

Final Answer: $2\% \Rightarrow$ D

Answer: (D) Go Back to Q44

Q45.

Solution

Concept – Biochemical Oxygen Demand (BOD): BOD is a key measure of the organic pollution load of water and sewage.

Step 1 – define it: BOD is the **amount of oxygen consumed by micro-organisms** as they biologically decompose the organic matter present in a sample over a set

period (commonly 5 days at 20°C, BOD_5).

Step 2 – interpret it: A high BOD means a lot of biodegradable organic matter, which depletes dissolved oxygen in the receiving water and harms aquatic life; treatment aims to reduce it.

Why the other options are wrong:

- Total dissolved solids is a separate physical measure of dissolved matter.
- pH measures acidity/alkalinity, not oxygen demand.
- Turbidity measures cloudiness from suspended particles, not the oxygen used in decomposition.

Final Answer: oxygen consumed in decomposing organic matter $\Rightarrow$ B

Answer: (B) Go Back to Q45

Q46.

Solution

Concept – the four-stage urban transport model: The sequence is trip generation $\rightarrow$ trip distribution $\rightarrow$ modal split $\rightarrow$ traffic assignment.

Step 1 – identify the stage described: Dividing the trips between the available travel modes (car, bus, metro, walk) answers the question "by which mode?".

Step 2 – name it: This is the **modal split** stage. It uses cost, time, comfort and availability to predict each mode's share of the trips.

Why the other options are wrong:

- Trip generation estimates how many trips each zone produces and attracts.
- Trip distribution links origins to destinations (from-where-to-where).
- Traffic assignment loads the mode-specific trips onto particular network routes.

Final Answer: Modal split $\Rightarrow$ C

Answer: (C) Go Back to Q46

Answer Key

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