

MAH M Arch CET Settlement Design and Planning

Sample Paper – 5

Total Questions	Total Marks	Duration	Exam Mode
10	20	12 Minutes	CBT (Online)

Instructions

- This paper contains 10 Multiple Choice Questions (Single Correct Answer), modelled on the Settlement Design and Planning portion of MAH M Arch CET entrance.
- Each correct answer carries +2 marks. There is no negative marking for incorrect or unattempted answers.
- Only one option is correct. Choose carefully.
- Syllabus: Ecological sustainability, citizen participation, informal settlements, building codes, public transit, EIA process, population projections, urban renewal, stormwater management, and housing policy.
- Use of mobile phones, calculators, or electronic gadgets is strictly prohibited.

Section D | Settlement Design and Planning
10 Questions × 2 Marks = 20 Marks

Q1. Which of the following **best defines** the concept of *ecological footprint* as applied to sustainable urban development?

- (A) The total land area degraded and converted to impervious surfaces by urban expansion and built-up development
- (B) The total area of biologically productive land and water required to support a population's consumption and absorb its waste outputs
- (C) The per capita carbon dioxide emissions generated by urban transportation and industrial activity within city limits
- (D) The ratio of green open spaces to total built-up area within a metropolitan planning region

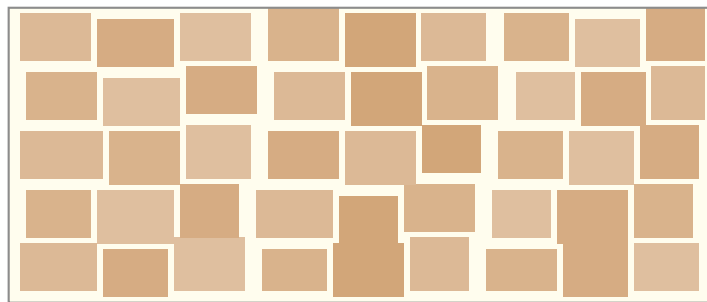


Q2. Sherry Arnstein's "Ladder of Citizen Participation" (1969) classifies levels of public involvement in planning. Which level represents the **highest and most empowering** form of citizen participation in this framework?

- (A) Citizen Control
- (B) Partnership
- (C) Placation
- (D) Consultation

Q3. The schematic below represents a portion of an **informal settlement** in an Indian city. Study the layout and identify the option that **best characterises** informal settlements/slums.

■ Self-built dwelling units (non-standardised size, no fixed plot alignment or setback)
Schematic: Informal settlement — dense, irregular housing (not to scale)



- (A) Informal settlements typically feature a planned street grid, formal land subdivision, and permanent load-bearing structures approved by local authorities
- (B) Informal settlements are exclusively found on government land and always have registered legal titles recognised by municipal bodies
- (C) Informal settlements are confined to the rural periphery of cities and are absent from core urban and inner-city zones
- (D) Informal settlements are characterised by insecure land tenure, inadequate access to basic services, substandard housing quality, and severe overcrowding



Q4. According to the **National Building Code (NBC) of India 2016**, what is the **minimum floor area** prescribed for a habitable room (living room or bedroom) in a residential building, along with its minimum width?

- (A) 7.5 sq m with a minimum width of 2.1 m
- (B) 7.5 sq m with a minimum width of 2.4 m
- (C) 9.5 sq m with a minimum width of 2.1 m
- (D) 11.0 sq m with a minimum width of 2.4 m

Q5. Which of the following **correctly describes** a defining operational characteristic of a **Bus Rapid Transit (BRT)** system that distinguishes it from conventional bus services?

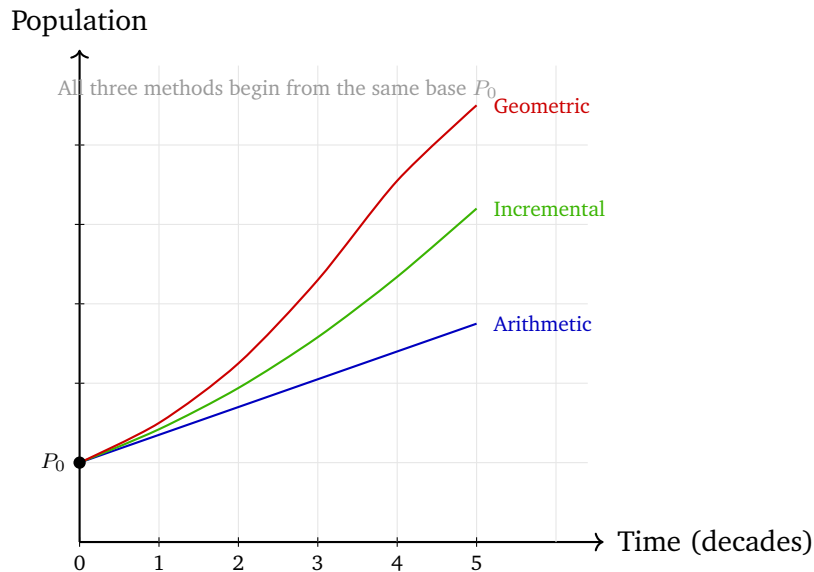
- (A) BRT requires dedicated underground tunnel infrastructure similar to heavy metro rail, making it unsuitable for surface-level corridors
- (B) BRT operates on segregated surface lanes with off-board fare collection, level boarding platforms, and high-frequency scheduled service
- (C) BRT consistently offers higher passenger capacity per hour per direction than heavy metro rail systems
- (D) BRT is only financially viable and operationally suitable for cities with a population exceeding 5 million

Q6. Under the **EIA Notification 2006** of India's Ministry of Environment, Forest and Climate Change, which of the following gives the **correct sequence of stages** in the Environmental Impact Assessment process for a Category A urban infrastructure project?

- (A) Screening → Scoping → EIA Study & Draft EIS → Public Consultation → Appraisal → Environmental Clearance
- (B) Public Consultation → Scoping → EIA Study → Screening → Environmental Clearance
- (C) EIA Study → Scoping → Public Consultation → Screening → Environmental Clearance
- (D) Scoping → Environmental Clearance → EIA Study → Public Consultation → Appraisal



Q7. The graph below plots three standard **population projection methods** starting from the same base population P_0 over a 5-decade planning horizon. Study the curves and select the **correct** statement.



- (A) The arithmetic increase method assumes a constant percentage rate of growth, producing the steepest (exponential) projection curve
- (B) The geometric increase method is best suited for old or slow-growing cities where the annual rate of population change is declining
- (C) The incremental increase method always gives the highest projected population and is therefore preferred for rapid-growth scenarios
- (D) For a rapidly growing city, the geometric (exponential) method gives consistently higher population estimates than the arithmetic method over the same planning horizon



Q8. Urban renewal is a broad planning intervention to improve deteriorated or underutilised urban areas. Which of the following **correctly describes** the relationship between **redevelopment** and **conservation** within urban renewal?

- (A) Urban renewal is synonymous with demolition: it always requires complete clearance of existing structures before any new construction can take place
- (B) Conservation of heritage structures and urban redevelopment are mutually exclusive strategies — a city must commit to one approach and exclude the other entirely
- (C) Urban renewal encompasses a spectrum of approaches, from full redevelopment of structurally unsound blighted areas to sensitive conservation and rehabilitation of historic urban fabric, applied contextually
- (D) Urban redevelopment is the preferred approach in all heritage precincts because it maximises Floor Area Ratio, increases local body revenues, and eliminates maintenance burdens on old structures

Q9. Urban flooding is a growing challenge for Indian cities. Which of the following correctly describes a core principle of **Sustainable Urban Drainage Systems (SUDS)** in stormwater management?

- (A) Stormwater should be combined with domestic sewage and routed through a single underground network to simplify infrastructure and reduce costs
- (B) SUDS aim to mimic the natural water cycle by promoting infiltration, detention, retention, and slow release of stormwater at or near its source
- (C) Effective urban flood management requires only the construction of larger-diameter underground stormwater drains to convey runoff rapidly
- (D) Increasing the proportion of impervious surfaces in an urban area reduces flooding by channelling rainwater away from buildings more quickly



Q10. The **National Urban Housing and Habitat Policy (NUHHP), 2007** was formulated by the Government of India to guide urban housing. Which of the following **best states** the primary aim of NUHHP 2007?

- (A) To promote sustainable development of habitat with a view to ensuring equitable supply of land, shelter, and services at affordable prices to all sections of society
- (B) To provide free housing exclusively to Below Poverty Line (BPL) families in urban slums through central government grants and direct construction
- (C) To mandate a statutory 25% reservation of all new housing scheme units for Economically Weaker Section (EWS) categories with penal provisions for non-compliance
- (D) To dissolve all state housing boards and replace them with a single national body responsible for the direct construction of public housing across India



Detailed Solutions**Sol. 1.****Solution**

Difficulty: Intermediate • Chapter: Ecological Footprint and Sustainable Urban Development

Quick Solution: The ecological footprint is the total area of biologically productive land and water required to support a population's consumption and absorb its waste. **Answer: (B).**

Concept — Ecological Footprint: The ecological footprint (EF) was developed by Mathis Wackernagel and William Rees at the University of British Columbia in the early 1990s and published in their 1996 book *Our Ecological Footprint: Reducing Human Impact on the Earth*. It measures human demand on nature by calculating the total area of **biologically productive land and water** needed to (a) produce all the resources a population consumes and (b) absorb all the waste it generates, particularly carbon dioxide through photosynthesis. Results are expressed in **global hectares (gha)**.

For urban planners, the EF reveals an uncomfortable reality: cities occupy only about 3% of the Earth's land surface yet consume far more resources than their physical footprint. A city of one million people can have an EF many times its built-up area because it draws on agricultural land, forests, fisheries, and carbon sinks spread across entire regions or countries. This spatial disconnect between a city's location and the ecological systems that sustain it is called **ecological overshoot** when the footprint exceeds global biocapacity — the rate at which ecosystems can regenerate resources. As of 2023, humanity as a whole overshoots biocapacity by approximately 75%.

For settlement planners, the EF informs decisions on urban density (compact cities reduce per-capita transport energy), green infrastructure (urban forests contribute to carbon absorption), sustainable construction (embodied energy in materials), and regional food systems (urban agriculture reduces food miles). India's per-capita EF of around 1.5 gha remains below the global average of 2.7 gha, but rapid urbanisation and consumption growth are widening it.

Analysis of each option:

- **(A) Total land degraded by urban expansion:** Incorrect. This describes *land degradation* or habitat loss from urban sprawl — a related but distinct environmental metric. The EF focuses on productive area needed, not area destroyed.



- **(B) Total bioproductive land and water area required: Correct.** This is the precise standard definition of the ecological footprint per Wackernagel & Rees and the Global Footprint Network.
- **(C) Per capita CO₂ emissions from urban transport/industry: Incorrect.** This describes a *carbon footprint* indicator. The carbon footprint is one component of the ecological footprint (translated into forest land required to absorb CO₂), but the two are not synonymous.
- **(D) Ratio of green spaces to built-up area: Incorrect.** This is the *urban green space ratio* or greenery coverage index — a separate urban planning metric used for thermal comfort and biodiversity, with no connection to the EF concept.

Final Answer: Ecological footprint = total bioproductive area required to sustain a population ⇒ B

Answer: (B) [Go Back to Q1](#)

Sol. 2.

Solution

Difficulty: Beginner • Chapter: Citizen Participation in Planning

Quick Solution: Arnstein's 8-rung ladder places Citizen Control at the very top, representing the highest degree of citizen power. **Answer: (A).**

Concept — Arnstein's Ladder of Citizen Participation (1969): Sherry Arnstein published "A Ladder of Citizen Participation" in the *Journal of the American Institute of Planners* in 1969. She proposed an eight-rung typology to categorise the *real* degree of power-sharing in public participation programmes, arguing that many government schemes offered the form of participation without the substance — what she called "the empty ritual of participation" in contrast to genuine citizen power.

The eight rungs, grouped into three zones, are:



Zone	Rung	Description	
Non-participation	1. Manipulation	Rubber-stamp advisory bodies	
	2. Therapy	Education/attitude adjustment	
Tokenism	3. Informing	One-way information flow	
	4. Consultation	Surveys and hearings (views not binding)	
	5. Placation	Token advisory roles	
Citizen Power	6. Partnership	Negotiated, shared decision-making	
	7. Delegated Power	Citizens hold dominant control	
	8. Citizen Control	Full community ownership and management	

Citizen Control (Rung 8) represents the condition in which community members hold full decision-making authority, financing, and management responsibility for a programme or geographic area — with no outside interference. In Indian planning, Area Sabhas and Ward Committees introduced under the 74th Constitutional Amendment Act are evaluated against this framework to assess genuine devolution. Participatory budgeting in cities like Pune and Porto Alegre-inspired models aspire to rung 6–7 levels.

Analysis of each option:

- **(A) Citizen Control: Correct.** This is Rung 8, the apex of the ladder and the highest form of citizen empowerment in Arnstein's framework.
- **(B) Partnership:** Incorrect. Partnership is Rung 6 within the Citizen Power zone and involves shared decision-making, but Delegated Power (7) and Citizen Control (8) represent higher levels of citizen authority.
- **(C) Placation:** Incorrect. Placation is Rung 5 at the top of the Tokenism zone. Citizens may advise but have no binding decision-making power; their input can be ignored.
- **(D) Consultation:** Incorrect. Consultation is Rung 4 (Tokenism). Citizens are surveyed or consulted but there is no guarantee their opinions will influence decisions — Arnstein famously compared this to “going through the motions.”

Final Answer: Highest rung on Arnstein's ladder = Citizen Control (Rung 8)

⇒ A

Answer: (A)

[Go Back to Q2](#)



Sol. 3.

Solution

Difficulty: Beginner • Chapter: Informal Settlements and Urban Poverty

Quick Solution: Informal settlements are defined by insecure land tenure, inadequate basic services, substandard housing, and overcrowding — exactly as the diagram illustrates. **Answer: (D).**

Concept — Characteristics of Informal Settlements/Slums: The United Nations Human Settlements Programme (UN-Habitat) defines a **slum household** as one that lacks one or more of five conditions: (1) access to improved drinking water, (2) access to improved sanitation, (3) sufficient living area (not more than 3 persons per habitable room), (4) structural quality and durability of dwelling, and (5) security of tenure. A settlement with a critical mass of such households constitutes a slum.

In India, informal settlements are variously called *jhuggi-jhopri* (JJ) clusters, bastis, chawls, unauthorised colonies, or squatter settlements. Their common physical and legal characteristics are:

- **Insecure tenure:** Structures are built on land without legal title, lease, or permission — often encroachments on government-owned land, railway land, or riverbed.
- **Irregular layout:** No formal plot subdivision, no standard setbacks, no planned road network — reflected in the diagram by the dense, randomly packed dwelling blocks with only narrow, undesigned paths between them.
- **Inadequate services:** Shared or absent piped water, open drainage, informal electricity connections, and absence of underground sewerage.
- **Substandard structures:** Non-engineered, load-bearing masonry or temporary materials (thatch, corrugated iron, polythene sheets) with minimal structural safety.
- **Overcrowding:** Very high densities, often exceeding 500–1,000 persons per hectare, with multiple families sharing small rooms.

According to Census 2011, India had approximately **65.5 million slum dwellers** (17.4% of the urban population) in 2,543 cities. In Mumbai, Dharavi (located in the heart of the city, not the periphery) housed an estimated 600,000–1 million people in roughly 175 ha, illustrating that informal settlements are emphatically not confined to peripheral rural zones.

Analysis of each option:



- **(A) Planned street grids and approved permanent structures:** Incorrect. A planned street grid and approved structures are defining features of *formal* housing — precisely what informal settlements lack. The diagram confirms irregular, non-standardised layouts.
- **(B) Legal title and municipal recognition:** Incorrect. The absence of secure legal land tenure is the single most defining characteristic of informality; registered title would make the settlement formal by definition.
- **(C) Confined to rural periphery, absent from core urban zones:** Incorrect. Iconic examples like Dharavi (Mumbai) and Govindpuri (Delhi) are centrally located. Informal settlements arise wherever land is available and affordable — including inner cities.
- **(D) Insecure tenure, inadequate services, substandard housing, overcrowding: Correct.** This matches the UN-Habitat definition and the physical characteristics visible in the diagram.

Final Answer: Informal settlements = insecure tenure + poor services + substandard housing + overcrowding ⇒ D

Answer: (D) [Go Back to Q3](#)

Sol. 4.

Solution

Difficulty: Intermediate • Chapter: National Building Code — Residential Provisions

Quick Solution: NBC 2016 Part 3 prescribes a minimum habitable room area of 9.5 sq m with a minimum width of 2.1 m. **Answer: (C).**

Concept — NBC 2016 Habitable Room and Residential Space Standards: The **National Building Code of India 2016** (NBC 2016), published by the Bureau of Indian Standards (BIS), is the comprehensive model code for all building construction in India. It is structured in 12 Parts covering planning and development control, structural design, fire safety, building services, and sustainability. Part 3 deals with “Development Control Rules and General Building Requirements” and specifies minimum space standards for residential buildings. Key residential space standards under NBC 2016 include:



Room Type	Minimum Area	Minimum Width
Habitable room (living/bedroom)	9.5 sq m	2.1 m
Single habitable room (only one)	12.0 sq m	2.4 m
Kitchen	5.0 sq m	1.8 m
Bathroom	1.8 sq m	1.2 m
Water closet (separate)	1.1 sq m	0.9 m

The minimum ceiling height for habitable rooms is 2.75 m (for naturally ventilated rooms) or 2.4 m for air-conditioned spaces. These standards ensure minimum health, light, ventilation, and livability conditions. The NBC is a model code; individual States and Urban Local Bodies (ULBs) may adopt higher standards through their Development Control Regulations (DCRs) or Building Bye-laws. For EWS/LIG housing under schemes like PMAY, carpet areas of 30 sq m (EWS) and 60 sq m (LIG) are prescribed per dwelling unit, which must comply with NBC room standards internally.

Understanding NBC standards is critical for evaluating housing design proposals, approving building plans, and assessing compliance of existing structures — all core competencies tested in the MAH M Arch CET.

Analysis of each option:

- **(A) 7.5 sq m, width 2.1 m:** Incorrect. 7.5 sq m was the older standard under some pre-2016 state bye-laws; the NBC 2016 raised this to 9.5 sq m to improve minimum habitability.
- **(B) 7.5 sq m, width 2.4 m:** Incorrect. Both values are wrong: the area is below NBC 2016 minimum, and 2.4 m minimum width is only prescribed for the case of a single (sole) habitable room.
- **(C) 9.5 sq m, width 2.1 m: Correct.** This matches NBC 2016 Part 3 specifications exactly for a standard habitable room.
- **(D) 11.0 sq m, width 2.4 m:** Incorrect. 11.0 sq m exceeds the NBC 2016 minimum; the minimum width of 2.1 m, not 2.4 m, applies to standard habitable rooms.

Final Answer: NBC 2016 minimum habitable room = 9.5 sq m, minimum width = 2.1 m ⇒

Answer: (C) [Go Back to Q4](#)



Sol. 5.

Solution

Difficulty: Intermediate • Chapter: Public Transit Modes — BRT, Metro, and LRT

Quick Solution: BRT's hallmark is surface-level dedicated lanes combined with off-board fare collection, level boarding, and high-frequency service — delivering metro-like performance at bus-level capital cost. **Answer: (B).**

Concept — Bus Rapid Transit (BRT) System Features: Bus Rapid Transit (BRT) is a high-quality, surface-based mass transit mode that achieves fast, reliable, high-capacity service through a bundle of physical and operational features. The Institute for Transportation and Development Policy (ITDP) codified these in the **BRT Standard**, which evaluates systems on a 100-point scale across six categories: corridor design, stations, vehicles, service planning, fare collection, and ITS/passenger information.

The defining characteristics of a full BRT system are:

- **Dedicated lane:** Exclusive, physically separated running way (typically centre-median) isolating BRT from mixed traffic, eliminating delay from congestion.
- **Off-board fare collection:** Passengers pay at enclosed station platforms before boarding, eliminating the fare-collection dwell time at each stop.
- **Level boarding:** Platform floor flush with the bus floor enables rapid, accessible boarding/alighting without steps.
- **High frequency:** Headways of 3–10 minutes during peak hours, eliminating the need to consult timetables.
- **Station infrastructure:** Enclosed weather-protected stations with real-time passenger information, branding, and amenities.
- **Articulated vehicles:** High-capacity 18 m or 24 m low-floor buses.

A comparison of urban transit modes in terms of capacity and cost:

Mode	Capacity (pphpd)	Capital Cost (approx.)
Heavy Metro (underground)	40,000–80,000	Rs. 300–600 cr/km
Light Rail Transit (LRT)	15,000–25,000	Rs. 100–200 cr/km
BRT (full standard)	10,000–45,000	Rs. 10–50 cr/km

Indian BRT examples include Janmarg (Ahmedabad), IndoreMetroBRT, Pune BRT, and Rajkot BRT. BRT is most effective in cities of 500,000–3 million where heavy metro rail is not cost-justified.

Analysis of each option:



- **(A) Requires underground tunnel infrastructure like metro:** Incorrect. BRT operates entirely on the surface using road infrastructure; tunneling would negate its primary cost advantage over metro.
- **(B) Dedicated lanes, off-board fare, level boarding, high frequency:** **Correct.** These four features together constitute the internationally recognised operational definition of a BRT system.
- **(C) Higher capacity than heavy metro rail per hour:** Incorrect. Heavy metro rail consistently exceeds BRT in maximum throughput (40,000–80,000 pphpd) because of longer, coupled trains and complete grade separation.
- **(D) Only suitable for cities above 5 million:** Incorrect. BRT is most economically appropriate for medium-sized cities (500,000–3 million) where the demand justifies dedicated lanes but not heavy metro rail investment.

Final Answer: BRT = dedicated surface lanes + off-board fare + level boarding + high frequency ⇒ **B**

Answer: (B) [Go Back to Q5](#)

Sol. 6.

Solution

Difficulty: Intermediate • Chapter: Environmental Impact Assessment Process

Quick Solution: The statutory sequence under EIA Notification 2006 is: Screening → Scoping → EIA Study & Draft EIS → Public Consultation → Appraisal → Environmental Clearance. **Answer: (A).**

Concept — EIA Notification 2006: Stages of the EIA Process: The **Environment Impact Assessment Notification, 2006** (issued under the Environment Protection Act, 1986 and its amendments) mandates prior Environmental Clearance (EC) for specified projects and activities. Projects are classified as Category A (requiring central-level appraisal by the Expert Appraisal Committee, EAC, under MoEFCC) or Category B (state-level appraisal by SEIAA/SEAC). The process for Category A projects involves five distinct stages:

Stage 1 — Screening: Determining whether a proposed project falls within the ambit of EIA Notification (i.e., whether it is listed in Schedule of the Notification) and its category (A or B). Category A projects automatically proceed without further screening.

Stage 2 — Scoping: The EAC/SEAC prepares **Terms of Reference (ToR)** defin-



ing the scope and methodology of the EIA study: baseline parameters to measure, area of influence, seasonal monitoring requirements, assessment methods, and mitigation framework. The proponent then conducts the EIA study as per ToR, which typically takes 1–2 years of baseline data collection and analysis.

Stage 3 — Public Consultation: After the draft EIA/EIS (Environmental Impact Statement) is prepared, it is placed in the public domain. A **public hearing** is conducted by the State Pollution Control Board (SPCB) in the project-affected area. Written objections from any person are also accepted within 30 days. Responses must be addressed in the final EIA.

Stage 4 — Appraisal: The EAC examines the final EIA report, evaluates adequacy of impact assessment and proposed Environmental Management Plan (EMP), considers public hearing responses, and makes a recommendation (grant/deny/defer EC) to MoEFCC.

Stage 5 — Environmental Clearance: MoEFCC (Category A) or SEIAA (Category B) issues the EC with site-specific conditions within 45 days of EAC recommendation. The EC is valid for a specified period and is subject to compliance monitoring.

Analysis of each option:

- **(A) Screening → Scoping → EIA Study & Draft EIS → Public Consultation → Appraisal → EC: Correct.** This is the exact statutory sequence mandated by EIA Notification 2006 for Category A projects.
- **(B) Public Consultation before Scoping:** Incorrect. Public consultation is Stage 3, after the EIA study is complete, not before scoping. Conducting it before the study would mean the public has no EIA document to respond to.
- **(C) EIA Study before Scoping:** Incorrect. Scoping (ToR preparation) must logically precede the EIA study because the study is conducted according to the ToR. A study conducted without ToR would have no defined methodology or scope.
- **(D) EC granted before EIA Study:** Incorrect. Granting clearance before the EIA study and public consultation is a fundamental violation of the EIA process and would defeat the entire statutory purpose of prior environmental assessment.

Final Answer: EIA sequence = Screening → Scoping → Study → Public Consultation → Appraisal → EC ⇒ A

Answer: (A) [Go Back to Q6](#)



Sol. 7.

Solution

Difficulty: Intermediate • Chapter: Population Projection Methods

Quick Solution: For a rapidly growing city, the geometric method compounds growth multiplicatively each decade, producing consistently higher projections than the arithmetic (additive) method. **Answer: (D).**

Concept — Population Projection Methods in Urban Planning: Population projections are the foundation of all infrastructure and land-use planning: water supply, sewerage, roads, schools, hospitals, and housing are all sized for a future design population. Indian engineers and planners use three primary methods (per CPHEEO, UDPFI, and standard planning practice):

1. Arithmetic Increase Method: Assumes a *constant absolute increase* in population per decade, regardless of the existing population base. Growth is purely additive:

$$P_n = P_0 + n \cdot \bar{I}_a$$

where $\bar{I}_a$ is the average arithmetic increase per decade and n is the number of decades. This produces a straight-line projection (as shown in blue in the graph). It is most appropriate for **old, slow-growing, or near-saturated cities** where growth is constrained by physical or demographic limits.

2. Geometric Increase Method: Assumes a *constant percentage growth rate* per decade. Growth compounds, so absolute additions become larger each decade even at the same percentage:

$$P_n = P_0 (1 + r)^n$$

where r is the mean decadal growth rate. This produces an exponential curve (red in the graph). It is most appropriate for **rapidly developing cities** experiencing industrialisation, in-migration, and high natural increase. For the same positive growth rate, the geometric projection is always higher than the arithmetic after the first period.

3. Incremental (Decreasing Rate of Growth) Method: An intermediate approach using the arithmetic mean of successive population increments and their second-order differences. The method captures a gradually changing growth trajectory, producing a quadratic-like curve (green in the graph) between the straight-line arithmetic and the exponential geometric. Best suited for cities with **moderate, changing growth rates**.

The graph confirms that at every time step after the base year: Geometric > Incremental > Arithmetic for the same initial population and a positive growth



scenario — as would be observed in a rapidly developing Indian city.

Analysis of each option:

- **(A) Arithmetic assumes constant percentage growth producing exponential curve:** Incorrect. Constant *percentage* growth is the definition of the *geometric* method. Arithmetic assumes constant *absolute* (additive) growth, producing a straight line, not an exponential curve.
- **(B) Geometric method best for slow-growing/declining cities:** Incorrect. Geometric (exponential) growth is appropriate for *rapidly growing* cities; for slow-growing or declining cities the arithmetic or incremental method is more appropriate.
- **(C) Incremental always gives the highest projected population:** Incorrect. As the graph shows, the geometric (exponential) curve lies *above* the incremental curve throughout. The incremental method is intermediate, not the highest.
- **(D) Geometric gives higher estimates than arithmetic for rapidly growing cities: Correct.** Because geometric growth compounds multiplicatively (larger absolute addition each decade) while arithmetic adds the same absolute amount, the geometric curve diverges above the arithmetic over time — as confirmed by both the graph and the formulae.

Final Answer: Geometric method > arithmetic method for rapidly growing cities $\Rightarrow$ D

Answer: (D) [Go Back to Q7](#)

Sol. 8.

Solution

Difficulty: Intermediate • Chapter: Urban Renewal — Redevelopment and Conservation

Quick Solution: Urban renewal encompasses a spectrum from complete redevelopment of blighted areas to sensitive conservation of historic fabric, with the approach selected based on heritage value, structural condition, and community context. **Answer: (C).**

Concept — Urban Renewal: A Spectrum of Approaches: Urban renewal refers to deliberate government or planning authority interventions to improve deteriorated, functionally obsolete, or underutilised urban areas. It emerged as a formal tool in post-World War II USA and Europe (particularly the 1949 and 1954 US Housing Acts) and has since evolved considerably in philosophy and



method.

The urban renewal spectrum includes:

Full Redevelopment (Clearance and Reconstruction): Complete or near-complete demolition of existing structures and replacement with new development. Historically exemplified by large-scale “slum clearance” programmes (e.g., Robert Moses in New York, early public housing in Chicago). Appropriate for areas with structurally unsafe or irreparably deteriorated buildings that have no heritage or conservation value and where community ties are minimal. Critiqued for destroying social networks and displacing vulnerable communities.

Rehabilitation and Renovation: Systematic improvement of existing structurally sound but deteriorated housing by upgrading infrastructure (water, sewerage, roads, electricity), repairing building fabric, and improving ventilation and sanitation. Preserves community character and is less disruptive than clearance. In-situ slum upgrading (e.g., under RAY and earlier JNNURM BSUP) follows this approach.

Conservation: Preservation and sensitive management of buildings, streetscapes, and urban landscapes of architectural, cultural, and social heritage value. Governed in India by the **Ancient Monuments and Archaeological Sites and Remains (AMASR) Act, 1958** (for centrally listed monuments), State Archaeology Departments, and Heritage Conservation Committees. Conservation does not prohibit all new construction but requires new development to be compatible in scale, massing, and material with the heritage context.

Adaptive Reuse: Conversion of existing buildings to new compatible uses — e.g., Mumbai’s mill lands (Girangaon textile mills) converted to mixed-use residential, commercial, and open space. Avoids demolition, reduces embodied-energy waste, and can revitalise areas without erasing their industrial heritage.

In India, the JNNURM Urban Renewal Component (2005–14), Smart Cities Mission (Area-Based Development projects), and state heritage conservation policies all blend these approaches, applying each contextually based on the building’s condition, heritage significance, community needs, and financial feasibility.

Analysis of each option:

- **(A) Urban renewal synonymous with demolition/clearance:** Incorrect. This conflates urban renewal with only its most extreme instrument. Modern urban renewal is explicitly understood as a range that includes conservation, rehabilitation, and adaptive reuse alongside redevelopment.
- **(B) Conservation and redevelopment are mutually exclusive:** Incor-



rect. Many successful urban renewal projects apply both approaches in different precincts of the same area: redeveloping structurally unsafe non-heritage blocks while conserving adjacent heritage streetscapes (e.g., Ahmedabad Heritage Precinct + surrounding redevelopment).

- **(C) Spectrum from full redevelopment to conservation, applied contextually: Correct.** This is the accepted planning understanding, reflected in Indian policy documents, UDPFI Guidelines, and Smart Cities Mission project frameworks.
- **(D) Redevelopment preferred in heritage zones to maximise FAR:** Incorrect. Heritage zones specifically require conservation of existing fabric; maximising FAR through demolition in a heritage precinct violates heritage regulations, the AMASR Act, and the spirit of UNESCO's Historic Urban Landscape (HUL) approach.

Final Answer: Urban renewal = contextual spectrum from redevelopment to conservation ⇒

Answer: (C) [Go Back to Q8](#)

Sol. 9.

Solution

Difficulty: Intermediate • Chapter: Urban Stormwater Drainage and Flood Management

Quick Solution: SUDS mimic the natural hydrological cycle through infiltration, detention, retention, and slow release of stormwater at or near source, reducing peak runoff volumes and rates. **Answer: (B).**

Concept — Sustainable Urban Drainage Systems (SUDS): Rapid urbanisation replaces permeable natural surfaces (soil, grassland, forests) with impervious materials (concrete, asphalt, tiled rooftops). This fundamentally alters the **urban hydrological cycle**: runoff volume increases sharply, peak flow rates accelerate, groundwater recharge drops, and receiving water bodies receive larger, faster, and more polluted discharges. Traditional urban drainage engineering responded by building larger underground pipes to evacuate stormwater rapidly — but this merely transferred the flood peak downstream while depleting groundwater aquifers and degrading urban waterbodies.

Sustainable Urban Drainage Systems (SUDS), also known as **Low Impact Development (LID)** in North America or **Water Sensitive Urban Design (WSUD)** in Australia, take the opposite philosophy: manage stormwater by mimicking the pre-development natural water cycle, keeping water on-site as



long as possible through:

- **Infiltration:** Permeable pavements, infiltration trenches, soakaways, and bioretention cells allow rainwater to percolate into the soil, recharging groundwater and reducing runoff volume.
- **Detention (temporary storage):** Detention ponds, bioswales, and rooftop storage temporarily hold stormwater and release it slowly at pre-development runoff rates, shaving the peak flow.
- **Retention (long-term storage):** Retention ponds, constructed wetlands, and rain gardens hold water for longer periods, providing habitat and amenity value while sustaining baseflows.
- **Source control:** Green roofs, rain gardens, and rainwater harvesting tanks manage stormwater at the point where it falls, before it enters the drainage system.
- **Slow conveyance:** Vegetated swales and open channels slow velocity, encourage infiltration, and improve water quality through natural filtration.

In India, **Chennai's catastrophic 2015 floods** (which caused economic losses exceeding Rs. 20,000 crore) and Mumbai's recurring monsoon flooding demonstrated the failure of pipe-only approaches. The **National Disaster Management Authority (NDMA) Guidelines for Urban Flooding** (2010), Chennai's Stormwater Drain Master Plan, and Pune's Integrated Stormwater Management Plan all incorporate SUDS principles. The Smart Cities Mission has also funded urban lakes restoration (retention) and permeable pavement pilot projects in several cities.

Analysis of each option:

- **(A) Combine stormwater and sewage in a single network:** Incorrect. This describes a *combined sewer* system, which is specifically *not* recommended in modern practice because storms cause combined sewer overflows (CSOs), discharging untreated sewage into waterbodies. Modern design prescribes *separate* stormwater and sewage systems.
- **(B) SUDS mimic natural water cycle through infiltration, detention, retention: Correct.** This accurately describes the core philosophy and operational mechanisms of SUDS/LID/WSUD, as defined by the CIRIA SUDS Manual (UK) and ITDP/C40 guidance.
- **(C) Only requires larger underground pipes:** Incorrect. Larger pipes address carrying capacity but do not address volume reduction (the root cause of flooding from increased impervious surface) and are expensive. They also create downstream flooding by delivering the peak faster and in greater volume.



- (D) **More impervious surfaces reduce flooding by channelling runoff quickly:** Incorrect. Impervious surfaces *increase* both the volume of runoff and the peak flow rate, which is the primary driver of urban flooding. This is the exact problem SUDS is designed to address.

Final Answer: SUDS = mimic natural water cycle through infiltration, detention, and retention ⇒ **B**

Answer: (B) [Go Back to Q9](#)

Sol. 10.

Solution

Difficulty: Beginner • Chapter: National Urban Housing and Habitat Policy 2007

Quick Solution: NUHHP 2007's stated mission is to promote sustainable habitat development ensuring equitable supply of land, shelter, and services at affordable prices to all sections of society. **Answer: (A).**

Concept — National Urban Housing and Habitat Policy (NUHHP), 2007: The **National Urban Housing and Habitat Policy, 2007** was formulated by the Ministry of Housing and Urban Poverty Alleviation (MoHUPA), Government of India. It superseded the National Housing Policy of 1994 and was designed to address the acute urban housing shortage and habitat quality challenges arising from India's accelerating urbanisation.

Mission Statement of NUHHP 2007 (verbatim):

“To promote sustainable development of habitat in the country, with a view to ensuring equitable supply of land, shelter and services at affordable prices to all sections of society.”

Key objectives and features of NUHHP 2007:

- Recognises housing as a **basic human right** and fundamental social need for all income groups, not just the poor.
- Promotes **public-private partnership (PPP)** as the primary vehicle for housing delivery at scale, moving away from exclusive state-built housing.
- Advocates **cross-subsidisation:** housing for upper/middle income groups in a scheme subsidises EWS/LIG units in the same project.
- Supports a **continuum of tenure** from rental to ownership, recognising that not all urban poor can afford ownership.



- Encourages development of **satellite towns and urban extensions** to decongest existing metropolitan areas.
- Promotes **innovative building materials and technologies** (e.g., prefabrication, stabilised compressed earth blocks) to reduce construction costs.
- Integrates with infrastructure: housing without water supply, sanitation, and transport connectivity does not constitute a complete “habitat.”
- Sets the policy framework that subsequently informed Rajiv Awas Yojana (RAY, 2011), JNNURM BSUP, and later **Pradhan Mantri Awas Yojana (PMAY, 2015–2022)** — though NUHHP 2007 itself was *not replaced* by PMAY; it remains the overarching housing policy.

NUHHP 2007 estimated an urban housing shortage of **24.7 million dwelling units** as of 2007, of which 99.6% was in the EWS/LIG categories. This stark finding shaped the policy’s emphasis on affordable housing delivery.

Analysis of each option:

- **(A) Equitable supply of land, shelter, and services at affordable prices to all: Correct.** This closely mirrors the NUHHP 2007 mission statement verbatim and captures its inclusive, multi-section scope.
- **(B) Free housing exclusively for BPL families through government grants:** Incorrect. NUHHP 2007 covers all income sections and promotes PPP-based delivery — not free, government-constructed housing exclusively for BPL. Such an interpretation would exclude the vast LIG and MIG shortage.
- **(C) Mandates 25% EWS reservation with penal provisions:** Incorrect. While NUHHP 2007 advocates inclusionary approaches, it does not prescribe a mandatory 25% EWS reservation with penal provisions as a central statutory mandate. Specific percentage reservations exist in some state-level DCRs (e.g., Maharashtra’s rule requiring 10–15% EWS/LIG in new residential projects), but these are state-level instruments, not the national NUHHP mandate.
- **(D) Dissolves housing boards, creates single national construction body:** Incorrect. NUHHP 2007 explicitly promotes coordination among existing agencies, PPP frameworks, and decentralised delivery — the opposite of centralising all construction in a single national body.

Final Answer: NUHHP 2007 mission = equitable supply of land, shelter, and services at affordable prices to all ⇒ A

Answer: (A) [Go Back to Q10](#)



Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	A	3	D	4	C	5	B
6	A	7	D	8	C	9	B	10	A

