

MAH M Arch CET Settlement Design and Planning

Sample Paper – 4

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: Urban hierarchy, new towns, planning standards, open spaces, township planning, satellite towns, urban heat island, GIS in planning, and affordable housing.
- Use of mobile phones, calculators, or electronic gadgets is strictly prohibited.

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

- Q1.** In urban geography, a ‘primate city’ is defined as one that:
- (A) Is disproportionately large relative to the second-largest city in the country (typically more than twice the population of the second city) and dominates the nation’s economic, political, and cultural life, often at the expense of other cities.
 - (B) Is the capital city of a country, regardless of its population size relative to other cities.
 - (C) Is the most rapidly growing city in a national urban system as measured by percentage annual population growth.
 - (D) Has the highest absolute density of population among all cities in a country, typically exceeding 50,000 persons per square kilometre.



Q2. Special Economic Zones (SEZs) in India are governed by the Special Economic Zones Act 2005. Which of the following statements about SEZs is **CORRECT**?

- (A) SEZs are exclusively located within 50 km of a major seaport or airport to facilitate export logistics.
- (B) All SEZs in India must be at least 500 hectares in extent, regardless of the sector they serve.
- (C) SEZ developers are required by law to provide free housing to all workers employed within the zone.
- (D) A designated SEZ area is treated as a deemed foreign territory for the purposes of trade operations, duties, and tariffs; goods manufactured within the SEZ for export are exempt from customs duty.

Q3. In residential plot development, 'ground coverage' (or 'site coverage') is defined as:

- (A) The ratio of the total built-up area on all floors to the plot area.
- (B) The ratio of the area covered by the building footprint (ground-floor built-up area) to the total plot area, expressed as a percentage. For example, a 300 m² building footprint on a 500 m² plot gives a ground coverage of 60%.
- (C) The total area of open spaces (setbacks, courtyard, and parking) expressed as a percentage of the total plot area.
- (D) The height of the building expressed as a ratio to the width of the abutting road, used to determine permissible floor count.

Q4. Chandigarh, designed by Le Corbusier and commissioned in the early 1950s, was built as a planned new capital city of Punjab (and later of Haryana). Which of the following features is **MOST** closely associated with Le Corbusier's planning concept for Chandigarh?

- (A) A concentric ring-and-radial road pattern centred on the Capitol Complex (Secretariat, High Court, Assembly), inspired by Howard's Garden City concept.

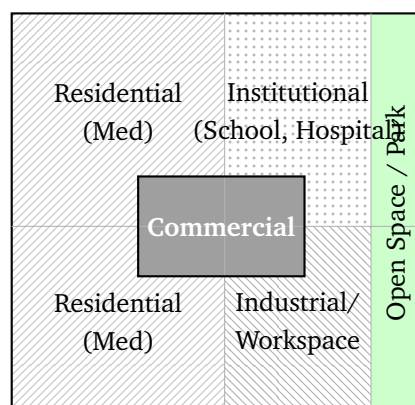


- (B) An organic street plan following the natural contours of the Shivalik foothills, with housing clusters oriented to maximise views of the hills.
- (C) A rectangular grid of sector-based neighbourhoods, each approximately $800 \text{ m} \times 1200 \text{ m}$, separated by a hierarchical road network (V1 to V7) ranging from fast vehicular roads to pedestrian paths, with a 'leisure valley' green strip running through the city.
- (D) A linear city stretching 30 km along the main highway, with all institutional uses along the central spine and residential sectors on either side.

Q5. As per the UDPFI (Urban Development Plans Formulation and Implementation) Guidelines, what is the recommended provision of recreational open space (parks and playgrounds) per 1000 urban population?

- (A) Approximately 10–12 square metres per person (i.e., 10,000–12,000 m^2 per 1,000 persons), equivalent to roughly 1.0–1.2 hectares per 1,000 persons.
- (B) 1–2 square metres per person.
- (C) 30–40 square metres per person.
- (D) The UDPFI Guidelines do not specify per capita open space standards; only State Town Planning Rules prescribe open space norms.

Q6. The land use plan shown below represents a typical 'integrated township' layout. Which of the following planning principles is **MOST** clearly demonstrated by this mixed-use township model?



- (A) Integrated townships must be exclusively located on greenfield sites and cannot be developed through urban renewal of existing built-up areas.



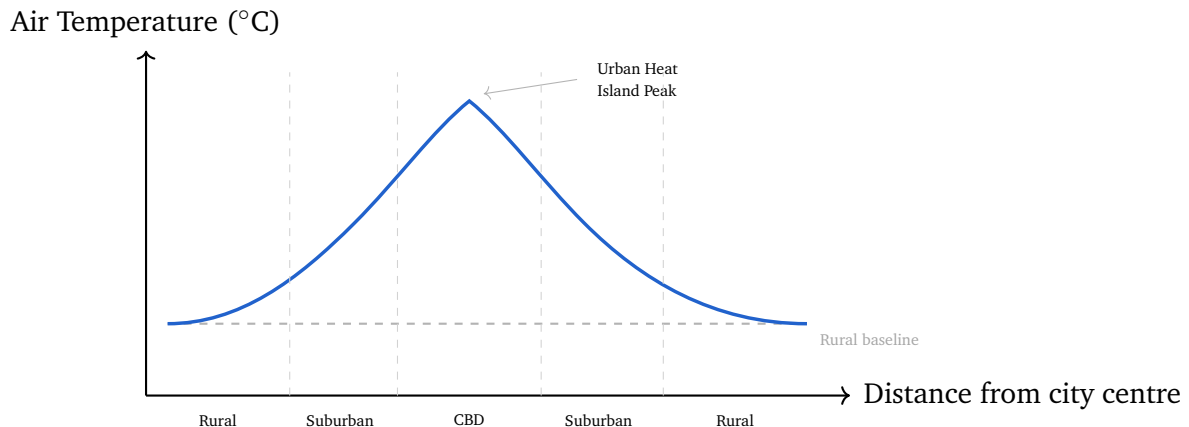
- (B) The industrial zone in a township should always be located at the centre of the layout to minimise transportation distances for raw material delivery.
- (C) Co-location of residential, commercial, institutional, and recreational uses within a self-contained township reduces commute distances and promotes walking and cycling for daily needs.
- (D) The provision of a separate industrial zone within a township is mandatory under the Maharashtra Regional and Town Planning Act and cannot be substituted with office/IT parks.

Q7. Satellite towns are a planning instrument used to decongest large metropolitan cities. Which of the following statements **MOST** accurately describes the concept of a satellite town?

- (A) A satellite town is defined as any town with a population between 1 lakh and 10 lakh that lies within the administrative boundary of a metropolitan municipality.
- (B) Satellite towns are exclusively developed by private real-estate developers without any government planning oversight, using only privately acquired land.
- (C) Satellite towns function purely as dormitory suburbs with no employment opportunities, requiring all working residents to commute daily into the parent city.
- (D) A satellite town is a relatively self-contained planned settlement located at a distance of 25–60 km from the parent metropolis, designed to absorb population and economic activity overspill by providing independent employment, housing, and social infrastructure, while maintaining functional links to the parent city.



Q8. The urban heat island (UHI) effect illustrated in the diagram below is primarily caused by which combination of urban characteristics?



- (A) The presence of tall buildings that block solar radiation from reaching the ground, cooling the urban surface compared with open suburban areas.
- (B) Replacement of vegetated surfaces with dark impervious paving and roofing materials (higher solar energy absorption), reduced evapotranspiration, anthropogenic heat from vehicles and air conditioners, and street canyons that trap long-wave radiation.
- (C) The higher population density in urban areas generating more body heat than sparsely populated suburban areas.
- (D) The removal of ozone-depleting substances from urban air conditioning systems, which reduces the protective ozone layer over cities.

Q9. 'Inclusionary zoning' (or 'inclusionary housing policy') is a planning mechanism used to promote affordable housing. Which of the following **MOST** accurately describes how inclusionary zoning works?

- (A) It requires private developers of market-rate residential projects above a certain threshold size to set aside a specified percentage of units (typically 10–20%) as affordable housing for low- or middle-income households, either on-site or through an equivalent financial contribution.
- (B) It is a scheme under which the government acquires private land at below-market prices to construct public housing.
- (C) It refers to land use zoning that exclusively designates certain zones for social housing and prohibits market-rate development in those zones.



(D) It is a tax imposed on vacant residential plots to compel landowners to develop affordable housing within a specified time frame.

Q10. Geographic Information Systems (GIS) are widely used in urban planning. Which of the following planning applications is **MOST** efficiently supported by GIS over traditional manual mapping methods?

- (A) Conducting community consultations and gathering qualitative feedback from residents about neighbourhood problems.
- (B) Architectural design of individual buildings within a new township, including structural calculations and MEP coordination.
- (C) Overlay analysis of multiple data layers (land use, slope, flood zones, existing roads) to identify suitable locations for a new residential development, integrating spatial constraints automatically.
- (D) Managing the administrative process of issuing building permits, inspecting completed buildings, and maintaining occupancy certificate records.



Detailed Solutions**Sol. 1.****Solution***Difficulty: Intermediate • Chapter: Urban Hierarchy and Settlement Theory*

Quick Solution: The primate city (Mark Jefferson, 1939) is disproportionately larger than all others in the national urban hierarchy — typically at least twice the second-ranked city — concentrating economic, political, and cultural functions, deviating from the rank-size rule. **Answer: (A).**

The concept of the **primate city** was formalised by geographer Mark Jefferson in 1939. A primate city is not simply the largest city in a country; it is one that is *disproportionately* larger than all others in the urban hierarchy—typically at least twice the size of the second-ranking city—and that overwhelmingly concentrates the country’s economic, political, cultural, and administrative functions. Classic examples include Bangkok (Thailand), Paris (France), Mexico City, and Lima (Peru). The rank-size rule (Zipf, 1949) suggests that in a well-developed urban system, the population of any city should be inversely proportional to its rank; primate cities deviate markedly from this rule.

Option (B) is wrong: capital cities such as Canberra, Brasília, and Ottawa are often *not* primate cities—they may be much smaller than the country’s economic centre, so capital status is an administrative designation unrelated to urban primacy. Option (C) confuses primacy with *growth rate*; a city can be the fastest growing without being disproportionately dominant in the size hierarchy. Option (D) confuses primacy with *population density*; a city can have extremely high density without being disproportionately large relative to the second city—primacy is purely a relative-size concept.

Answer: (A)**Sol. 2.****Solution***Difficulty: Intermediate • Chapter: Special Economic Zones and Industrial Policy*

Quick Solution: Under the SEZ Act 2005, an SEZ is a “deemed foreign territory” for duties — goods manufactured for export are fully customs-exempt, enabling duty-free import of raw materials and capital goods for export production. **Answer: (D).**

Under the **Special Economic Zones Act, 2005**, an SEZ area is notified as a *deemed foreign territory* for the purposes of duties, tariffs, and trade operations. Goods manufactured in an SEZ for export are fully exempt from customs duty,



and supplies into an SEZ from the Domestic Tariff Area (DTA) are treated as deemed exports eligible for export benefits. This legal fiction enables duty-free importation of raw materials, capital goods, and components for use in export production, making SEZs attractive hubs for export-oriented industries.

Option (A) is wrong: SEZs can be established anywhere in India; location near a port or airport is not a statutory requirement. Several major IT SEZs (in Pune, Hyderabad, Bengaluru, and Noida) are entirely inland. Option (B) is wrong: multi-product SEZs require a minimum of 500 ha, but *sector-specific* SEZs (IT/ITeS, biotechnology, gems & jewellery, textiles, handicrafts) have much smaller minimum area thresholds—as low as 10 ha for IT/ITeS zones. Option (C) is wrong: free housing for all workers is not a statutory requirement under the SEZ Act; housing provision may feature in an integrated township application attached to an SEZ but is not mandated for all SEZs.

Answer: (D)

Sol. 3.

Solution

Difficulty: Beginner • Chapter: Development Controls and Planning Standards

Quick Solution: Ground coverage (building coverage ratio) is the ratio of the ground-floor building footprint area to the total plot area, expressed as a percentage. It measures how much of the site is physically occupied at grade level.

Answer: (B).

Ground coverage (also called *site coverage* or *building coverage ratio*) is defined as the ratio of the ground-floor footprint—the area of land physically covered by the building at grade level—to the total plot area, expressed as a percentage. It measures what fraction of the site is occupied by the building's plan area at ground level.

$$\text{Ground Coverage (\%)} = \frac{\text{Ground-floor Built-up Area (m}^2\text{)}}{\text{Total Plot Area (m}^2\text{)}} \times 100$$

Example: a 300 m² building footprint on a 500 m² plot gives $\frac{300}{500} \times 100 = 60\%$ ground coverage. Most Indian municipal by-laws cap ground coverage at 50–75% depending on land use and plot size.

Option (A) is wrong: aggregating all floors gives the **Floor Area Ratio (FAR)** or **Floor Space Index (FSI)**, which is an entirely different development control parameter. Option (C) is wrong: the sum of setbacks, courtyard, and parking areas as a proportion of plot area gives the *open space percentage*, the complement of ground coverage, not the same measure. Option (D) is wrong: the



height-to-road-width ratio is a separate sky-plane or street-section control used to limit building height based on adjacent road width—unrelated to ground coverage.

Answer: (B)

Solution

Difficulty: Intermediate • Chapter: Urban Planning History and Case Studies

Quick Solution: Chandigarh (Le Corbusier, 1951–52) uses a CIAM-modernist sector grid (800 m × 1,200 m), a V1–V7 hierarchical road system, a diagonal Leisure Valley green belt, and the Capitol Complex at Sector 1. **Answer: (C).**

Le Corbusier's master plan for **Chandigarh** (prepared 1951–52, with Pierre Jeanneret and Jane Drew) is rooted in CIAM (Congrès Internationaux d'Architecture Moderne) modernist urbanism, not in Ebenezer Howard's Garden City principles or organic site-responsive planning. Its defining characteristics are:

- Sol. 4.** • **Sector grid:** the city is divided into rectangular sectors, each approximately 800 m × 1,200 m, designed as a self-sufficient neighbourhood unit for roughly 10,000–15,000 residents, with an internal market, schools, health centre, and community facilities.
- **Hierarchical road network (V1–V7):** seven categories of road from inter-city highways (V1) down to cycle tracks and pedestrian paths (V7), keeping through traffic entirely outside sector interiors.
 - **Leisure Valley:** a continuous green belt of parks and open spaces running diagonally through the sector grid.
 - **Capitol Complex:** the Secretariat, Legislative Assembly, and High Court are clustered at Sector 1 on the northern edge.

Option (A) is wrong: Chandigarh's layout is a rectangular grid, not ring-and-radial; Le Corbusier explicitly rejected Howard's concentric Garden City model. Option (B) is wrong: the plan is rigidly geometric and does not follow the foothills' contours; sectors are uniform regardless of topography. Option (D) is wrong: a linear city along a single highway axis describes Soria y Mata's Ciudad Lineal concept—Chandigarh's plan is compact and roughly rectangular.

Answer: (C)



Solution

Difficulty: Beginner • Chapter: Urban Planning Standards (UDPFI)

Quick Solution: The UDPFI Guidelines recommend 10–12 m² of recreational open space per person (1.0–1.2 ha per 1,000 persons), broadly consistent with the WHO minimum of 9 m²/person. **Answer: (A).**

The **UDPFI (Urban Development Plans Formulation and Implementation) Guidelines**, published by the Ministry of Urban Development, Government of India, provide indicative per-capita open space norms for use in preparing city development plans. The recommended recreational open space—encompassing parks, playgrounds, and tot-lots—is approximately **10–12 m² per person**, translating to **10,000–12,000 m² (1.0–1.2 ha) per 1,000 persons**. The norms are disaggregated by hierarchy:

- Sol. 5.**
- Neighbourhood tot-lot: ≈0.4 ha per 5,000 persons
 - Sector/colony park: ≈1.2 ha per 15,000 persons
 - District park: ≈4.0 ha per 1,00,000 persons

The WHO recommends a minimum of 9 m²/person of accessible urban green space, broadly consistent with the UDPFI benchmark.

Option (B) (1–2 m²/person) represents emergency evacuation or minimum hard open space—far below the recreational standard; it is not the UDPFI norm. Option (C) (30–40 m²/person) substantially exceeds even the most generous international benchmarks and is not prescribed by UDPFI. Option (D) is factually incorrect: UDPFI explicitly provides per-capita recreational open space benchmarks as planning guidance.

Answer: (A)

Sol. 6.

Solution

Difficulty: Intermediate • Chapter: Urban Development Typologies

Quick Solution: An integrated township deliberately mixes residential, commercial, institutional, and recreational land uses within one project to enable proximity and self-sufficiency, reducing dependence on private vehicles and long motorised commutes. **Answer: (C).**

An **integrated township** is a self-contained planned urban settlement that deliberately mixes multiple land uses—residential (varying densities), commercial/retail, institutional (schools, hospitals, community centres), recreational (parks, open space), and often light industrial or workspace—within a single contiguous project area. The defining planning rationale is *proximity and*



self-sufficiency: by co-locating the principal generators of daily trips, residents can meet most everyday needs—shopping, schooling, healthcare, recreation, work—without travelling long distances by motorised vehicle.

This reduces dependence on private cars, shortens commute distances, and creates conditions conducive to walking, cycling, and non-motorised transport. Several Indian states (Maharashtra, Haryana, Rajasthan, Gujarat) have issued integrated township regulations that require minimum thresholds of each land use category precisely to ensure this mixed-use character.

Option (A) is wrong: Maharashtra's integrated township regulations and those of several other states permit township development on urban fringe or peri-urban land but do not prohibit urban-renewal applications; the restriction described does not exist universally. Option (B) is wrong: industrial zones are conventionally placed at the *periphery*—typically downwind and downstream—to minimise pollution, noise, and heavy truck traffic in residential areas; centralising industry would conflict with livability objectives. Option (D) overstates the MRTD Act's requirements; IT parks, business parks, and service-industry campuses regularly substitute for conventional heavy industry in approved Maharashtra township schemes.

Answer: (C)

Sol. 7.

Solution

Difficulty: Intermediate • Chapter: Metropolitan Planning and New Town Development

Quick Solution: A satellite town is a planned, relatively self-contained settlement 25–60 km from the parent metropolis with its own employment base, housing, and social infrastructure — unlike a dormitory suburb that depends entirely on the parent city. **Answer: (D).**

The concept of the **satellite town** emerged as a metropolitan planning tool in the mid-20th century to provide a planned alternative to uncontrolled peri-urban sprawl. Unlike a *dormitory suburb*—which is entirely dependent on the parent city for employment, commerce, and higher-order services—a satellite town is designed to be *relatively self-contained*. It provides its own employment base (industry, services, or knowledge economy), adequate housing across income groups, full social infrastructure (schools, hospitals, markets), and civic amenities. The typical planning distance of 25–60 km from the parent metropolis keeps the town functionally connected via road and rail while allowing it to develop its own identity and economic base.

Indian examples include Navi Mumbai (planned to decongest Mumbai),



New Town Rajarhat (Kolkata), Greater Noida (Delhi NCR), and Magarpatta City/Pimpri-Chinchwad (Pune).

Option (A) is wrong: satellite towns are planned settlements *outside* the metropolitan administrative boundary, not sub-units within it; population thresholds do not define the concept. Option (B) is wrong: satellite towns in India are predominantly planned and developed by State Development Authorities (CIDCO for Navi Mumbai, HUDA, NOIDA Authority), with significant government land acquisition, infrastructure investment, and regulatory oversight. Option (C) describes a *dormitory suburb*—the antithesis of a satellite town; the defining distinction of a satellite town is precisely its locally generated employment that reduces dependency commuting.

Answer: (D)

Solution

Difficulty: Intermediate • Chapter: Urban Climate and Environmental Planning

Quick Solution: The Urban Heat Island effect is caused by dark impervious surfaces absorbing more solar radiation, loss of evapotranspiration, anthropogenic heat from vehicles and air conditioners, and street canyons trapping long-wave radiation. **Answer: (B).**

The **Urban Heat Island (UHI)** effect is a well-documented micro-climatic phenomenon in which urban areas experience systematically higher air and surface temperatures than surrounding rural and suburban areas. The primary causal factors—all of which are illustrated by the rising temperature profile from rural to CBD—are:

- Sol. 8.**
- **Impervious dark surfaces:** asphalt roads, dark-coloured rooftops, and concrete absorb more incoming solar radiation (lower albedo) and store it as heat, re-emitting it as long-wave thermal radiation through the night.
 - **Loss of evapotranspiration:** replacing soil and vegetation with sealed impervious surfaces eliminates the latent heat cooling effect of plant transpiration and soil moisture evaporation.
 - **Anthropogenic heat:** vehicles, industrial machinery, air conditioners (which exhaust heat outdoors), and building heating/cooling systems release heat directly into the urban air.
 - **Street canyon effect:** tall buildings flanking narrow streets form ‘canyons’ that repeatedly reflect and trap outgoing long-wave radiation, preventing it from escaping to the sky.

Planning mitigation strategies include green roofs, cool/reflective pavements



(high-albedo coatings), urban tree canopy expansion, permeable surfaces, parks, and blue infrastructure.

Option (A) is wrong: tall buildings in street canyons *trap* heat; they do not cool cities by blocking the sun—the net effect of urban canyons is heat retention. Option (C) is wrong: human metabolic heat is a negligible contributor (typically <1% of total urban heat output) compared with vehicles, machinery, and surface heat storage. Option (D) is wrong: stratospheric ozone depletion is a global atmospheric phenomenon; it does not cause the localised, surface-level urban heat island. The UHI is entirely a surface energy-balance and land-cover phenomenon.

Answer: (B)

Sol. 9.

Solution

Difficulty: Intermediate • Chapter: Affordable Housing Policy and Planning Mechanisms

Quick Solution: Inclusionary zoning requires private developers of market-rate residential projects above a size threshold to set aside a specified share (typically 10–20%) of units as affordable housing, or pay an equivalent in-lieu fee. **Answer: (A).**

Inclusionary zoning (IZ) is a land-use planning tool that leverages the profitability of private market-rate residential development to cross-subsidise affordable housing production. The mechanism: when a developer proposes a residential project above a defined size threshold (commonly 20 or more units), a stipulated share of those units—typically 10–20%—must be priced and sold or rented as *affordable housing* for households earning below a specified income benchmark (often 60–80% of the Area Median Income). Many IZ ordinances offer an alternative compliance pathway through *in-lieu fees* paid into a dedicated affordable housing trust fund.

IZ was pioneered in Montgomery County, Maryland (USA) in 1974. In the UK it operates as *Section 106 planning obligations*. In India, various PMAY components and state policies (e.g., Maharashtra's affordable housing norms under DCPR 2034) embody IZ-like requirements for larger residential projects.

Option (B) describes government-led *public land acquisition for social housing*—a supply-side intervention distinct from IZ, which does not involve government acquisition of private land. Option (C) describes *exclusive social-housing zoning*—the antithesis of IZ; inclusionary zoning integrates affordable units within mixed-income market-rate developments rather than segregating them into dedicated zones. Option (D) describes a *vacancy tax* or *land use penalty mecha-*



nism—a fiscal tool to deter land hoarding, conceptually distinct from IZ.

Answer: (A)

Sol. 10.

Solution

Difficulty: Intermediate • Chapter: Urban Planning Technology and GIS

Quick Solution: GIS excels at suitability overlay analysis — simultaneously integrating multiple spatial data layers (land use, slope, flood zones, roads) to identify locations meeting all site-selection criteria, a task that would take weeks of manual mapping. **Answer: (C).**

Geographic Information Systems (GIS) are spatial data management and analysis platforms that excel at integrating, querying, and overlaying multiple geo-referenced data layers simultaneously. *Suitability overlay analysis* is the canonical GIS strength: a planner can simultaneously layer land use maps, topographic slope grids, delineated flood-prone zones, environmental buffers, groundwater recharge areas, existing road networks, and ownership cadastre data to automatically compute zones that satisfy *all* site selection criteria simultaneously. This multi-criteria spatial analysis—which would require weeks of manual overlay drafting with traditional methods—is accomplished by GIS in minutes, with full reproducibility and auditability.

Other important GIS applications in urban planning include: school and hospital catchment analysis, noise pollution mapping, population density and growth visualisation, utility network management, traffic flow modelling, and remote-sensing-based land use change detection.

Option (A) is wrong: community consultations and qualitative resident feedback are social engagement exercises (focus groups, surveys, charrettes); GIS is a spatial data analysis platform that has no mechanism for gathering or processing qualitative opinion. Option (B) is wrong: architectural design of buildings uses CAD (Computer-Aided Design) and BIM (Building Information Modelling) software at the building scale; GIS operates at the urban, metropolitan, and regional scale and cannot perform structural calculations or MEP coordination. Option (D) is wrong: building permit tracking, inspection scheduling, and occupancy certificate management are *document workflow* and *regulatory administration* tasks, handled by e-governance platforms and OBPS (Online Building Permission Systems), not by GIS.

Answer: (C)



Answer Key

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

