

QUESTION BANK

LATEST 5 YEARS [2017 ~ 2021]

Q&A with ESSENTIAL NOTES
For Architecture & Planning

All Pages Printed in
COLOUR

For Better Recall in Exam

&

**EMMERSIVE
READING
EXPERIENCE**



By Faculty of Architecture

GATE ARCHITECTURE.com

Volume

1

QUESTION BANK

Q&A with ESSENTIAL NOTES
For Architecture & Planning

All Pages Printed in
COLOUR

For Better Recall in Exam
&

**EMMERSIVE
READING
EXPERIENCE**



By Faculty of Architecture



GATE ARCHITECTURE .com

Volume

1

Unique Features

★ LATEST 5 YEARS Question Bank in 1 Volume

Better contents in best price.

It will complement if you had purchased any Question Bank previous year.

★ All pages colour prints

For Immersive Reading Experience

For better recall in exam!

★ Extensive coverage

Question Paper of GATE since 2017 to 2021 (5 Years)

★ Essential Notes

Notes has been provided not just for answering a question but also for extra coverage!

★ Comprehensive content

With total 180 pages. And it can be added further for upgrade without prior information!

★ QR-coded text

You can scan QR-code printed in the book from your phone for extra reading related of the subject.

Preface

Complete Syllabus through Question Bank: The best way to prepare for an exam like GATE is through a comprehensive study of previous-year question papers. It takes less time to cover most part of the syllabus. Solving the previous GATE questions helps aspirants to understand the exam pattern, knowing the level of questions, and predict the pattern. At the same time, you may be aware that just knowing the answers of previous-year question paper is just not enough.

For example, if the question is: The teahouse is a feature of which type of landscape architecture? And you learnt that the answer is 'Japanese Garden'. It is best to support the answer with additional notes & figures about different types of gardens, i.e. French, English, and Chinese, etc. One reason for providing such notes is that it is rarely possible that in the next few years, the same question will be repeated. But it is quite possible that if a question is asked from a related topic, you should answer it if you have gone through additional studies or notes.

Essential Notes: Providing answer with essential notes & explanation is the main features of this Question Bank. It's been tried to cover the maximum part of the syllabus through providing supportive notes and answer itself.

QR-code based book: We have been using QR-code based deep learning for our GATE reference books since 2015. It gave us encouragement when it came to news that a teacher **Ranjitsinh Disale** won \$1mn Global Teacher Prize 2020 for using QR-codes based book for teaching in school.

This book is very concise. It contains a very exhaustive source of reference material for a deep understanding of the subject. So, it has QR-codes. Scan the code for further studies if you need. There are many QR code scanners available on Google Play Store or apple App Store.

We recommend, you scan the QR-codes with the app that comes with your phone itself. Installing the 'QR Code Reader' app from the Google Play Store or the Apple App Store may contain advertisement that could be irritating and downgrade reading experience. Some phone can scan QR-codes directly with its camera itself without any app!

All Pages Color Printed: All pages and illustrations of this Question Bank are color printed. Paper published by National Center for Biotechnology Information; US suggests that there are positive effects of color illustration on cognitive process.

Complete Package: This question bank contains question papers of last 31 years from 2021 to 1991. All it makes it the complete Question Bank. When you go through all these, you will get an idea of how question pattern and trend has changed over time. This will greatly help you to focus on the part of the syllabus which are frequently asked in exams.

Feedback: We keep improving the contents of this book through the feedback and suggestion from the readers. You are always welcome for your valuable suggestion and feedback about this book. If you find better contents or alternative solution, send us to gatearchitecture@gmail.com

We request you to write a fair review on the ecommerce webpage from where you have bought the book.

This book should provide an edge to your study. Hopeful that it will make you confident and feel easy on question pattern.

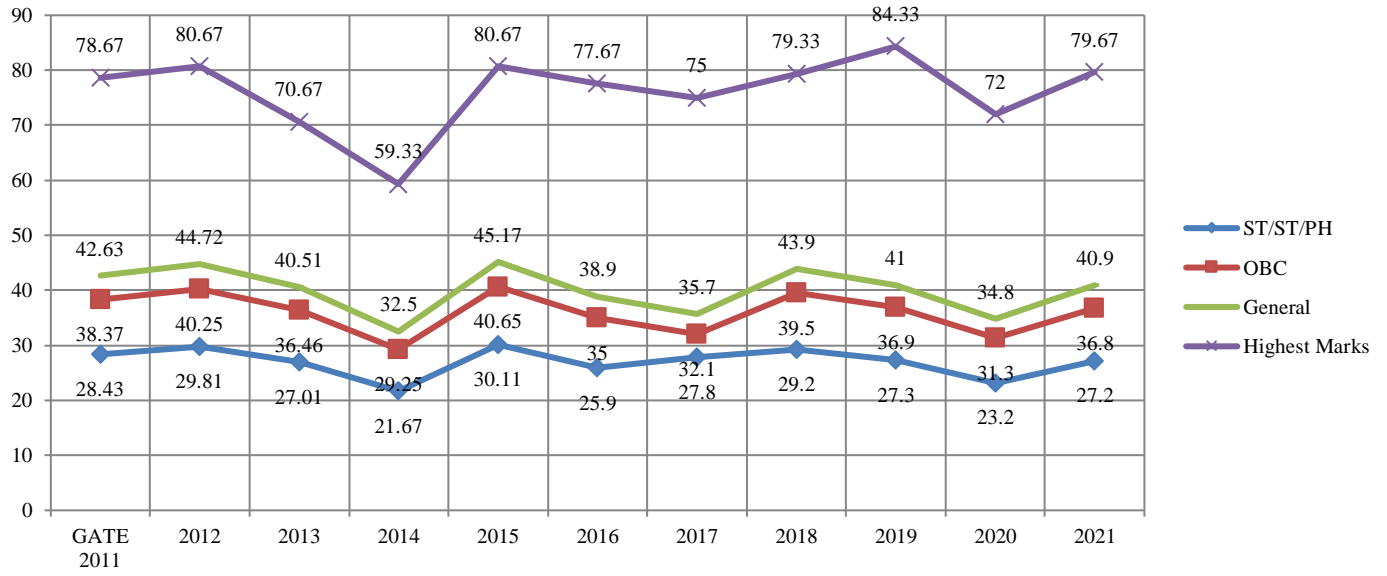
Fab Quote”

“The interesting observation is to try to work with people, but even more than that, to try to make them successful. If you try to make others successful, they, in turn, will try to make you successful. No matter how brilliant you are, no matter how good you are, no matter how hard you work, if you rely only on yourself and believe you don't need the help of others, you are sadly mistaken. If you engage everybody around you by helping them, they will help you, in turn. And you will be more successful than you ever dreamed of.” – Former Director, Goldman Sachs

Happy reading. Make most of this book. We wish you all the best for GATE 2022.



Cutoff Marks



Appeared for GATE AR

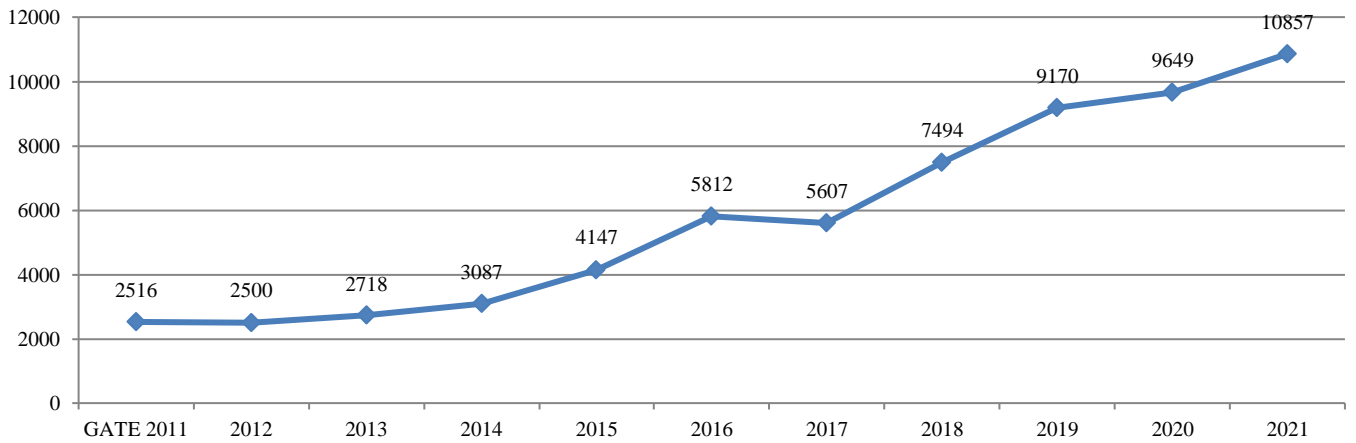


Table of Contents

	Page range	No. of pages	Remarks
Preface	~	2	
Benefits of Colour Prints	~	4	
Memory Techniques	~	6	
Syllabus for GATE 2022	~	3	
Question Bank ~ Volume 1			
GATE 2021 Q&A with Essential Notes	1 ~ 32	32	
GATE 2020 Q&A with Essential Notes	33 ~ 84	52	
GATE 2019 Q&A with Essential Notes	85 ~ 130	46	
GATE 2018 Q&A with Essential Notes	131 ~ 166	35	
GATE 2017 Q&A with Essential Notes	167 ~ 180	13	
Question Bank ~ Volume 2			
GATE 2021 Q&A with Essential Notes			
GATE 2020 Q&A with Essential Notes			
GATE 2019 Q&A with Essential Notes			
GATE 2018 Q&A with Essential Notes			
GATE 2017 Q&A with Essential Notes			
Question Bank ~ Volume 3			
GATE 2021 Q&A with Essential Notes	1 ~ 32	32	
GATE 2020 Q&A with Essential Notes	33 ~ 84	52	
GATE 2019 Q&A with Essential Notes	85 ~ 130	46	
GATE 2018 Q&A with Essential Notes	131 ~ 166	35	
GATE 2017 Q&A with Essential Notes	167 ~ 180	13	
Question Bank ~ Volume 4			
GATE 2021 Q&A with Essential Notes			
GATE 2020 Q&A with Essential Notes			
GATE 2019 Q&A with Essential Notes			
GATE 2018 Q&A with Essential Notes			
GATE 2017 Q&A with Essential Notes			
GATE 2016 Q&A with Essential Notes			
GATE 2015 Q&A with Essential Notes			
GATE 2014 Q&A with Essential Notes	122 ~ 140	19	
GATE 2013 Q&A with Essential Notes			
GATE 2012 Q&A with Essential Notes			
GATE 2011 Q&A with Essential Notes			
GATE 2010 Q&A with Essential Notes			
Question Bank ~ Volume 5			
GATE 2021 Q&A with Essential Notes			
GATE 2020 Q&A with Essential Notes			
GATE 2019 Q&A with Essential Notes			
GATE 2018 Q&A with Essential Notes			
GATE 2017 Q&A with Essential Notes			
GATE 2016 Q&A with Essential Notes			
GATE 2015 Q&A with Essential Notes			
GATE 2014 Q&A with Essential Notes			
GATE 2013 Q&A with Essential Notes			
GATE 2012 Q&A with Essential Notes			
GATE 2011 Q&A with Essential Notes			
GATE 2010 Q&A with Essential Notes			
GATE 2009 Q&A with Essential Notes			
GATE 2008 Q&A with Essential Notes			
GATE 2007 Q&A with Essential Notes			
GATE 2006 Q&A with Essential Notes			
GATE 2005 Q&A with Essential Notes			
GATE 2004 Q&A with Essential Notes			
GATE 2003 Q&A with Essential Notes			
GATE 2002 Q&A with Essential Notes			
GATE 2001 Q&A with Essential Notes			

In pursuit of constantly improving this book, we would delete or add contents without prior information!

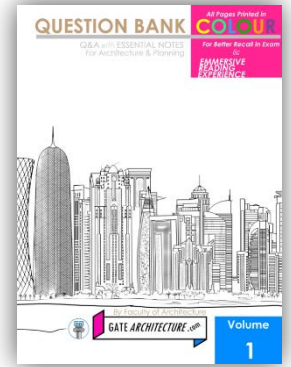
Benefits of Colour Illustration

Why is the Question Bank *COLOUR* printed?

A color printed book has numerous benefits to the readers in comparison to a black & white printed book. Following are the articles published in reputed journals and media elaborating the impacts of color illustrations. (Color: US spelling, Colour: UK spelling)

Color Images More Memorable Than Black and White (Article)

Psychologists have found that colors enhance an individual's visual memory. From a series of experiments, researchers learned that subjects were more likely to recall the color version of an image than the same scene in black and white. The results, which appear in a issue of the *Journal of Experimental Psychology: Learning, Memory and Cognition*, also indicate that natural colors make a difference.



Felix Wichmann of the Max Planck Institute for Biological Cybernetics and his colleagues conducted five experiments, using subjects with normal vision. Participants initially viewed 48 images, half in color and half in black and white. The picture subjects fell into four different categories: landscapes, flowers, rock formations and man-made objects. Each category provided a different check on the results. For example, the flower pictures varied in terms of color, not shape, but those of rock formations offered the opposite. After presenting these images, the team mixed in 48 new scenes, showed the entire set of 96, and then recorded whether the subjects remembered the originals. The color images, they found, made much longer-lasting impressions than did the black-and-white ones.

To assess whether the visual memory system treats natural color and false color differently, the researchers presented subjects with altered images, such as scenes with reddish grass. They found that people did not remember these scenes any better than they did the black-and-white versions. According to study co-author Karl Gegenfurtner, this indicates that the visual memory system is tuned to the color schemes of the natural world. "If stimuli are too strange," Gegenfurtner says, "the system simply doesn't engage them as well." Advertising or design industries might do well to take note of the findings. To catch someone's eye, bright colors might be best, but if "the aim is more to have an image 'stick' in the viewer's memory," Wichmann suggests, "unnatural colors may not be suitable."

**SCIENTIFIC
AMERICAN**

(Author: Greg Mone, 2002, Scientific American: <https://www.scientificamerican.com/article/color-images-more-memorab/>)

The Influence of Colour on Memory Performance: A Review (Research Paper)

Human cognition involves many mental processes that are highly interrelated, such as perception, attention, memory, and thinking. An important and core cognitive process is memory, which is commonly associated with the storing and remembering of environmental information. An interesting issue in memory research is on ways to enhance memory performance, and thus, remembering of information. Can colour result in improved memory abilities? The present paper highlights the relationship between colours, attention, and memory performance. The significance of colour in different settings is presented first, followed by a description on the nature of human memory. The role of attention and emotional arousal on memory performance is discussed next. The review of several studies on colours and memory are meant to explain some empirical works done in the area and related issues that arise from such studies.

Introduction

Memory refers to the mental process of encoding, retaining, and retrieving environmental information. How the human cognitive system deals with the memorization process remains the centre of research among cognitive psychologists. One of the most interesting and challenging questions in contemporary memory research is on ways to enhance human memory performance. Many variables have been proposed to contribute to the retrieval operations and one of the variables is colour, which will be discussed thoroughly in the present paper.

Colour is believed to be the most important visual experience to human beings. It functions as a powerful information channel to the human cognitive system and has been found to play a significant role in enhancing memory performance. Colour can be very effective in learning and educational setting, marketing, communication, or even sport. For instance, a marketing study has found that colour can increase brand recognition by up to 80%. Most advertisements use colour as one of the important element in influencing people's attention, attitude towards the product, and pressuring decision making. According to White, coloured advertisements can attract people to read the advertisement up to 42% more often than the non-coloured advertisement. This shows the importance of colour in making the information or message more attractive to the public.

In the educational setting, higher demand is put on excellent academic achievement. The extent to which students utilize their cognitive abilities is also important and may contribute to better academic achievement. The cognitive abilities of the students refer to the way the students perceive, pay attention, remember, think, and understand the lessons. There need to be strategies to facilitate the learning process and colours can play a role in motivating students to learn and profit from their educational experiences.

Memory Techniques

How to enhance your memory so that you can remember fast to get best of the Question Bank?

For that, we have already this book printed in **Colour** as it supports better cognitive activity of your brain. On our website: gatearchitecture.com, there is a tab '**Student Yoga**' that may help perform you better in exam. Other than this, following articles can help you in better learning. Many students complain that they can't remember necessary material. They say they understand the content when they read it, but can't recall it later. There is a difference between understanding and remembering. You may understand all the systems of the human body (they make sense when you read about them), but that doesn't mean you'll be able to recall the necessary terms. Fortunately, there are memory techniques and strategies for you to use. Some will be more useful for some subjects and content than others.

Baker/baker paradox

There is a term "elaborative encoding" that is well-illustrated by a nifty paradox known as the Baker/baker paradox, which goes like this: If a person tells two people (you and your friend) to remember the same word, if the person says to your friend, "Remember that there is a guy named Baker." That's his name. And the person says to you, "Remember that there is a guy who is a baker." The person comes back to your friend at some point later on, and says, "Do you remember that word that I told you a while back? Do you remember what it was?" The friend who was told his name is Baker is less likely to remember the same word than what was told to you that his job is a baker. Same word, different amount of remembering; that's weird. What's going on here?



Well, the name Baker doesn't actually mean anything to you. It is entirely untethered from all of the other memories floating around in your skull. But the common noun "baker" -- we know bakers. Bakers wear funny white hats. Bakers have flour on their hands. Bakers smell good when they come home from work. Maybe we even know a baker. And when we first hear that word, we start putting these associational hooks into it, that make it easier to fish it back out at some later date.

20 Memory Techniques Experiment with these techniques to make a flexible, custom-made memory system that fits your style of learning.

1. Learn from the general to the specific.

Imagine looking at a new painting this way. Blindfold yourself. Put a magnifying glass up to your eye. Move your face within inches of the painting. Now, yank the blindfold off and begin studying the painting, one square inch at a time. Chances are, even after you finished "looking" at the painting this way, you wouldn't know what it is. Unfortunately, many students approach new courses and textbooks just this way. They feel driven to jump right in and tackle the details before they get the big picture. Here is a different approach. Before you begin your next reading assignment, skim it for the general idea. You can also use this technique at the beginning of a course. Ask someone who has taken it to quickly review it with you. Do a textbook reconnaissance of the reading assignments for the entire course. This technique works best at the beginning of a term, but it's never too late to use it. If you're lost, step back and look at the big picture. The details might make more sense.

Meditation for Memory

Meditation is the most effective way of improving the ability of our mind to pay attention to tasks – which is important for improving retention and converting a short-term memory into a long-term memory.

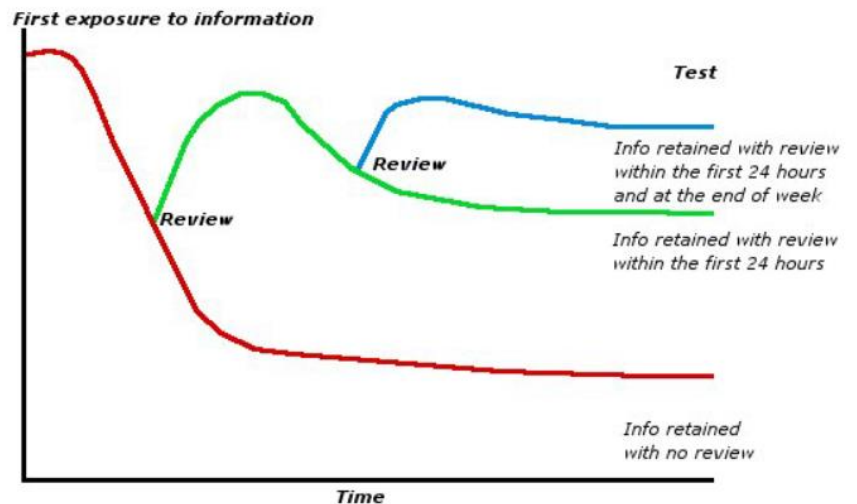
Studies have demonstrated that practicing meditation improves our ability to focus on smaller details. (Maclean et al. 2010).

Source: <https://www.magneticmemorymethod.com/how-to-remember-things/>

The Importance of Review

The most important part of note taking is reviewing your notes after class. Notes do very little if they are never looked at again! The average student forgets up to 80 percent of the information within 24 hours of learning it. Students can dramatically increase the amount of information they retain by reviewing the information within that first 24 hours. When reviewing, edit and clarify notes, focusing on main ideas and key points. One way of doing this is by using the Cornell System. To further improve retention, do a weekly review as well. Choose one night of the week (weekends work well for this) to go over notes from the past week of class for all of your classes. Plan to spend about 30 minutes per class. Review also improves retention of information from textbooks and can be done in almost the same manner. After reading

each chapter or section of the text, do a short review within 24 hours and a comprehensive review on a weekly basis. Nobody is anxious to add another task to their list of things to do, but reviewing often saves time in the long run, since consistent review leads to less cramming before tests. Studying for a short period of time each day is more effective than studying for many hours on a single day.



(Figure: Adapted from WWU's Tutorial Center)

Source: <https://selkirk.ca/sites/default/files/Learning/Selkirk-College-Learning-Success-Memory-Techniques-Workshop.pdf>



TEDx
YouTube
 How to remember?



Syllabus 2022

Architecture and Planning (AR): New Pattern

New

The Paper contains General Aptitude (GA) section (15 Marks) as applicable for all papers of GATE 2022.

The Paper consists of two parts covering the syllabus: Part A (60 marks) and Part B (25 marks).

Part A is compulsory for all the candidates.

Part B contains two **optional** sections: Part B1 (Architecture) and Part B2 (Planning).

Candidates have to choose any one of these during the examination! (Part B1 or Part B2)

Part A: General

Section 1: Architecture, Planning and Design

Architectural Graphics; Visual composition in 2D and 3D; Computer application in Architecture and Planning; Anthropometrics; Organization of space; Circulation- horizontal and vertical; Space Standards; Universal design; Building byelaws; Codes and standards;

Section 2: Construction and Management

Project management techniques e.g. PERT, CPM etc. ;Estimation and Specification; Professional practice and ethics; Form and Structure; Principles and design of disaster resistant structures; Temporary structures for rehabilitation;

Section 3: Environmental Planning and Design

Natural and man-made ecosystem; Ecological principles; Environmental considerations in Planning and design; Environmental pollution- types, causes, controls and abatement strategies; Sustainable development, goals and strategies; Climate change and built environment; Climate responsive design;

Section 4: Urban Design, landscape and Conservation

Historical and modern examples of urban design; Elements of urban built environment –urban form, spaces, structure, pattern, fabric, texture, grain etc.; Concepts and theories of urban design; Principles, tools and techniques of urban design; Public spaces, character, spatial qualities and Sense of Place; Urban design interventions for sustainable development and transportation; Development controls – FAR, densities and building byelaws.; Urban renewal and conservation; heritage conservation; historical public spaces and gardens; Landscape design; Site planning;

Section 5: Planning process

Salient concepts, theories and principles of urban planning; concepts of cities - Eco-City, Smart City; Concepts and theories by trendsetting planners and designers; Ekistics; Urban sociology; Social, Economic and environmental cost benefit analysis; Methods of non-spatial and spatial data analysis; Development guidelines such as URDPFI;

Section 6: Housing

Housing typologies; Concepts, principles and examples of neighbourhood; Residential densities; Affordable Housing; Real estate valuation;

Section 7: Services and Infrastructure

Firefighting Systems; Building Safety and Security systems; Building Management Systems; Water treatment; Water supply and distribution system; Water harvesting systems; Principles, Planning and Design of storm water drainage system; Sewage disposal methods; Methods of solid waste management - collection, transportation and disposal; Recycling and Reuse of solid waste; Land-use – transportation - urban form inter-relationships; Design of roads, intersections, grade separators and parking areas; Hierarchy of roads and level of service; Para-transits and other modes of transportation, Pedestrian and slow moving traffic planning;

Part B1: Architecture

Section B1.1: History and Contemporary Architecture

Principles of Art and Architecture; World History of Architecture: Egyptian, Greco-Roman classical period, Byzantine, Gothic, Renaissance, Baroque-Rococo, etc.; Recent trends in Contemporary Architecture: Art nouveau, Art Deco, Eclecticism, International styles, Post Modernism, Deconstruction in architecture, etc.; Influence of Modern art and Design in Architecture; Indian vernacular and traditional Architecture, Oriental Architecture; Works of renowned national and international architects;

Section B1.2: Building Construction and Structural systems

Building construction techniques, methods and details; Building systems and prefabrication of building elements; Principles of Modular Coordination; Construction planning and equipment; Building material characteristics and applications; Principles of strength of materials; Alternative building materials; Foundations; Design of structural elements with different materials; Elastic and Limit State design; Structural systems; Principles of Pre-stressing; High Rise and Long Span structures, gravity and lateral load resisting systems;

Section B1.3: Building Services and Sustainability

Solar architecture; Thermal, visual and acoustic comfort in built environments; Natural and Mechanical ventilation in buildings; Air-Conditioning systems; Sustainable building strategies; Building Performance Simulation and Evaluation; Intelligent Buildings;

Where,
 $PMV = \text{Predicted Mean Vote Index}$
 $M = \text{metabolic rate}$
 $L = \text{thermal load - defined as the difference between the internal heat production and the heat loss to the actual environment - for a person at comfort skin temperature and evaporative heat loss by sweating at the actual activity level}$

What is PPD?

Through PMV, we can predict the thermal sensation of a population, but this doesn't paint the whole picture. We also need to consider the level of satisfaction of the occupants in a space, to get a more holistic idea of if and how thermal comfort can be achieved. For this, Fanger developed another equation to relate the PMV to the predicted percentage of dissatisfied (PPD).

(Source: <https://www.simscale.com/blog/2019/09/what-is-pmv-ppd/>, https://www.engineeringtoolbox.com/predicted-mean-vote-index-PMV-d_1631.html)

Q3. Indian satellite sensor that can be used for very high resolution mapping of urban areas is

- (A) LANDSAT (B) CARTOSAT (C) RESOURCESAT (D) MODIS (Marks to all)

Cartosat series of satellites launched by ISRO (Indian Space Research Organization) with high-resolution imaging sensors are primarily intended for applications in the areas of cartography and large-scale mapping. Some of the important applications include monitoring of irrigation infrastructure created under Accelerated Irrigation Benefit Program, NUIM (National Urban Information System), Topo-thematic mapping at 1:10,000 scale, Urban Infrastructure planning, and many State level Geospatial applications.



Figure: Imaginary by Cartosat -3 of an urban area in Doha

Cartosat-3 is a third-generation agile advanced earth observation satellite with high-resolution imaging capability. Developed by the ISRO, it will replace the IRS series. Cartosat-3 has a panchromatic resolution of 0.25 metres making it the imaging satellite with highest resolution and Mx of 1 metre with a high-quality resolution, which is a major improvement from the previous payloads in the Cartosat series.

(Source: <https://www.isro.gov.in>, <https://www.sciencedirect.com/topics/earth-and-planetary-sciences/cartosat>, <https://www.business-standard.com>)

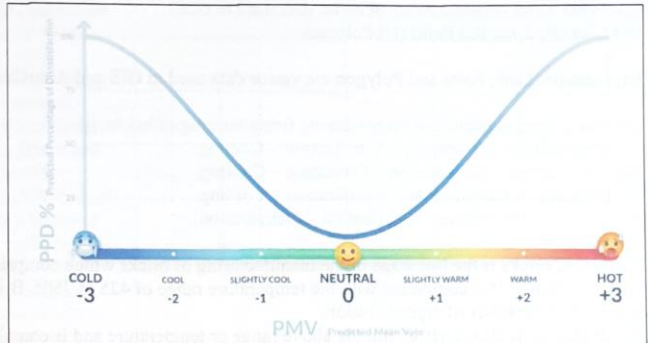


Figure: Once the PMV is calculated, the PPD, or index that establishes a quantitative prediction of the percentage of thermally dissatisfied occupants (i.e., too warm or too cold), can be determined. PPD essentially gives the percentage of people predicted to experience local discomfort. The main factors causing local discomfort are unwanted cooling or heating of an occupant's body. Common contributing factors are drafts, abnormally high vertical temperature differences between the ankles and head, and/or floor temperature.

Figure: Environmental and personal factors that influence thermal comfort

Gordon Cullen, the humanist and urbanist designer, first published his seminal work "Townscape" in 1961, and a concise version of it was published ten years later (Cullen 1961, 1971). Cullen liked to call his theory and approach to understanding and manipulating the elements of townscape an "Environment Game." He presented his discovery of humanistic urban design in three "gateways": Motion (Serial Vision), Position (Here and There), and Content (This and That). A detailed review of the entire Townscape treatise is not intended here but a short revisit of the serial vision. In concerning "Optics," Cullen calls a series of "jerks or revelations" that we may experience when walking through a town or city at a uniform speed as Serial Vision. He considers that a town can become visible in a deeper sense if vivid contrasts can be felt, as "the human mind reacts to the difference between things," or "the drama of juxtaposition" (Source: http://papers.cuminead.org/data/works/att/cf2003_m_017.content.pdf)

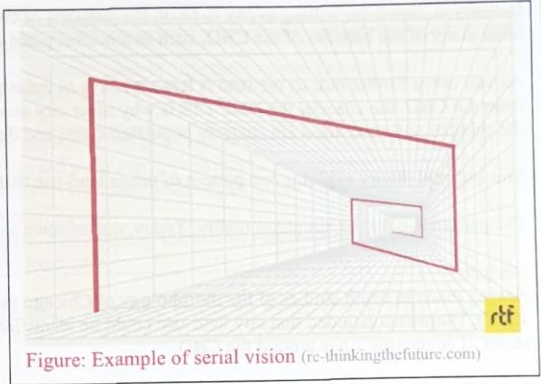


Figure: Example of serial vision (re-thinkingthefuture.com)

Rashtrapati Bhavan, New Delhi, India

Designed by Herbert Baker and Edward Lutyens, the new capital was envisioned on the principles of Garden City. The Rajpath that

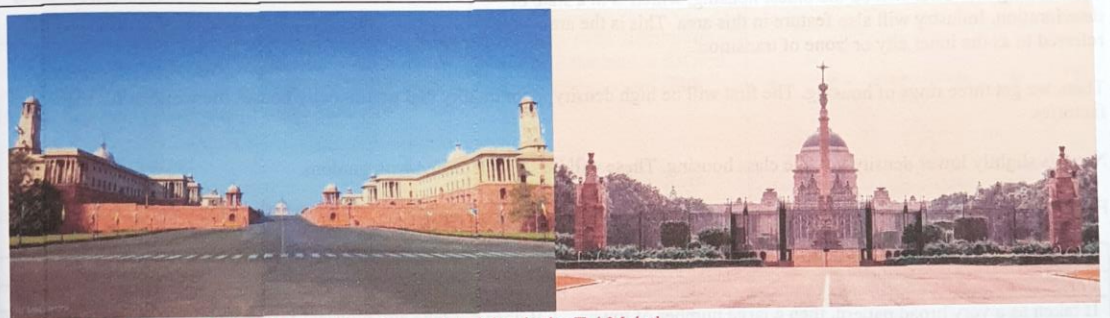


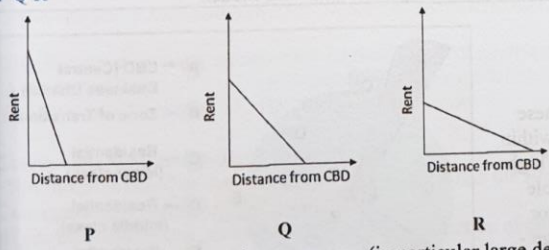
Figure: Another example may be considered as serial vision is the Taj Mahal.

leads to the Rashtrapati Bhavan has a series of visual screening as well as enhancing elements, thus, creating a progression of frames. A sense of progression is created and keeps the observer moving forward. The avenues and the water bodies confine you to the focal point and as you move forward your frame gets bigger with multiple buildings and different views. An illusion of nearness and closeness that is created in the first frame fades out as one approaches the main building in focus, revealing more and more buildings of different scales and functions. In this example, serial vision is used to suggest the majestic and authoritative nature of the building in focus.



Q8. A waste water pipe connecting two inspection chambers (IC) is laid at a slope of 1:200. The Invert Level of the starting IC is -450 mm. The Invert level of the second pit at a distance of 40 m from the first IC is (A) -650 mm (B) -200 mm (C) -250 mm (D) -550 mm

Q9. From the images P, Q and R given below, select the corresponding land use categories according to Alonso's Bid Rent Theory. P Q R



- (A) P-Manufacturing; Q-Residential; R-Retail
- (B) P-Retail; Q-Residential; R-Manufacturing
- (C) P-Residential; Q-Retail; R-Manufacturing
- (D) P-Retail; Q-Manufacturing; R-Residential

Explanation: It can be seen that commerce (in particular large department stores/chain stores) is willing to pay the greatest rent to be located in the CBD. The CBD is very valuable for them because it is traditionally the most accessible location for a large population. This large population is essential for department stores, which require a considerable turnover. As a result, they are willing and able to pay a very high land rent value. They maximise the potential of their site by building many stories.

As you move from the CBD, commerce is unwilling to pay as much for a site. In fact, what they are willing to pay declines rapidly.

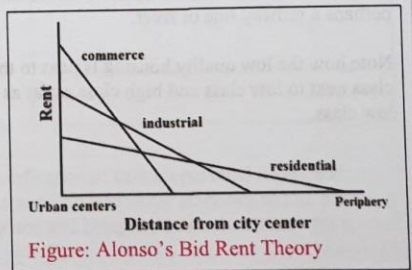


Figure: Alonso's Bid Rent Theory

Evaluation:

For	Against
Some cities seem to follow Hoyt's sectors. Bristol, for example, has a very clear industrial sector following a main rail line and the River Avon.	Like Burgess' there is little reference to the physical environment.
It provides us with an alternative set of explanations to Burgess.	The growth of sector can be stopped as land-use leapfrogs out of the old inner city. For example, out of town council estates have prevented large high-class sector developing in other areas of Bristol.
Communication routes (Rivers, roads, railways) do often provide a very definite boundary to a sector/land-use.	Again, like Burgess, there is no reference to out of town developments.

In addition, the division between land-uses in both models is far too clear-cut. Firstly, you would not suddenly walk from lower to middle to higher class housing. Also, all zones will have a mixture of land-uses. Residential zones will have shops and industry in amongst them.

They do, however, give us a bench mark for comparison and allow us to have a basic understanding of the complex set of processes that determine the distribution of land-use within a city.

Central place theory

Christaller's **central place theory** basically tells us that if there is an even distribution of population, all with equal money and transport opportunities, and the land is flat and featureless, then settlements will follow a distribution pattern according to size. **The distribution will follow one of three patterns:**

1. Market Optimising:

The shoppers in smaller settlements divide into three equal groups when shopping in the three nearest larger settlements.

2. Transport Optimising:

Shoppers in smaller settlements divide into two equal groups when shopping in the two nearest larger settlements.

3. Administration Optimising:

All shoppers in the smaller settlements shop in the nearest large settlement.

The largest settlement, which is in the centre of the hexagon, will be surrounded by a number of smaller settlements. People from the small settlements will visit the large settlement for a particular good or service that their village does not provide. People cannot cross the boundary hexagons because Christaller says they must shop in their nearest central place.

He also introduced the concepts of **threshold** and **range**:

Threshold is the minimum number of people needed to support a service.

Range is the maximum distance people are prepared to travel to purchase a good or service.

Source: <https://s-cool.co.uk/a-level/geography/urban-profiles/revise-it/models-from-burgess-and-hoyt>

Q10. The urban land use model based on the concept of a polycentric city is known as

- (A) Burgess Model
- (B) Harris and Ullman model
- (C) Hagerstrand's Model
- (D) Homer Hoyt's model

Concept and need for Multiple Nuclei Model

This model is based on the structure of Chicago just like the Burgess model or Concentric zone model of 1925.

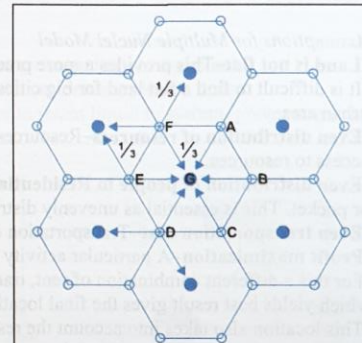
It can be considered as an attempt to explain the structure of city taking into account the complexity and growth over time.

Harris and Ullman argued that a city might start with a single central business district (CBD) but over the time the activities scatter and gets modified.

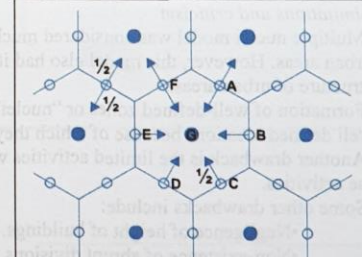
The scattered activities attract people from surrounding areas and acts as smaller nuclei in itself.

These small nuclei gain importance and grow in size and starts influencing the growth of activities around them.

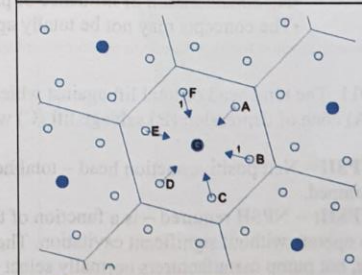
The need for this model was to provide a more realistic explanation of the cities. The influence of cars on personal travel and greater movement of goods provided opportunity in different places instead of concentrating all economic activities in one place. People started optimizing their business for maximum profit by locating at different place and bringing down their rent with a slight increase in transportation cost.



● Highest order settlements ○ Lower order settlements
Figure: Market Optimising



● Highest order settlements ○ Lower order settlements
Figure: Transport Optimising



● Highest order settlements ○ Lower order settlements
Figure: Administration Optimising

- A - CBD (Central Business District)
- B - Zone of Transition
- C - Residential (lower class)
- D - Residential (middle class)
- E - Residential (upper class)

Zone Model by Ernest Burgess

...purchase land. The further ...
...races, flats and high rises) ...
...centric ring model.
...s have influenced the pattern ...
...houses the workers for the ...
...features into account. Burgess ...
...of any city will be influenced ...
...area.
...ly available allowing more ...
...mean that commuter villages ...
...e from the edge of the urban ...
...en this.
...ification has meant that some ...
...can now be found in traditional ...
...council estates have built up on ...
...ese are now some of the m ...
...manufacturing industry ...
...his model.

- A - CBD (Central Business District)
- B - Zone of Transition
- C - Residential (lower class)
- D - Residential (middle class)
- E - Residential (upper class)
- F - Industry

Example of liner regression in a trip generation model:

$$Y = 0.91 + 1.44X_1 + 1.07X_2$$

number of trips
number of workers
number of cars

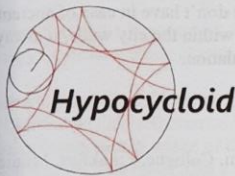
Where,

- Y = No. of trips per household = Independent variable
- X₁ = No. of workers per household = Dependent variable
- X₂ = No. of cars per household = Dependent variable

(Source: <https://ocw.tudelft.nl/wp-content/uploads/2015/08/comprehensive-guide-regression-1.pdf>
<https://www.analyticsvidhya.com/blog/2015/08/comprehensive-guide-regression/>)

Q15. The curve traced by a point on a circle rolling inside another circle is known as

- (A) hypocycloid (B) helix (C) involute (D) hyperbola



(Source: <https://mathimages.swarthmore.edu/index.php/Involute>)

Q16. The law of Primate City was first proposed by

- (A) Samuel A. Stouffer (B) Colin Clark
- (C) Mark Jefferson (D) Harold Hotelling

The idea of primacy was first introduced by Mark Jefferson in 1939. His proposition was that nationalism crystallizes in primate cities which are super eminent in both size and national influence. He assessed the degree of primacy by computing the ratio of the size of the second and third ranking cities to that of the largest one. He found that in the forty-six countries of the world the largest cities were two or three times as large as the next largest city. The ratio of the population of the three largest cities approximated the sequence 100:30:20 (i.e. the third largest is one-fifth the size of the largest). According to him there are various reasons for a city to exceed its neighbors in size, but once it did so the process became cumulative giving it an impetus to grow and draw away from all other cities in character as well as size. The particular ratio sequence has been later ignored, though the concept of the primate city and primacy is widely used.

A primate city is the largest city in its country or region, disproportionately larger than any others in the urban hierarchy. A primate city distribution is a rank-size distribution that has one very large city with many much smaller cities and towns, and no intermediate-sized urban centers: a King effect, visible as an outlier on an otherwise linear graph, when the rest of the data fit a power law or stretched exponential function. The law of the primate city was first proposed by the geographer Mark Jefferson in 1939. He defines a primate city as being "at least twice as large as the next largest city and more than twice as significant." Aside from size and economic influence, a primate city will usually have precedence in all other aspects of its country's society, such as being a center of politics, media, culture and education and receive most internal migration. The Rank-Size Rule.

Examples of Countries with Primate Cities

- Paris (9.6 million) is definitely the focus of France while Marseilles has a population of 1.3 million.
- Similarly, the United Kingdom has London as its primate city (7 million) while the second-largest city, Birmingham, is home to mere one million people.
- Mexico City, Mexico (8.6 million) outshines Guadalajara (1.6 million).
- A huge dichotomy exists between Bangkok (7.5 million) and Thailand's second city, Nonthaburi (481,000).

The rank-size rule says that 'when ranks of cities, arranged in descending order, are plotted against their populations (rank 1 being given to the largest, and so on) in a doubly logarithmic graph, a rank-size distribution results' (Das and Dutt 1993: 125), or to put it in much simpler words: 'In an ordered set of cities representing a given country, the product of the rank and size of a city is constant' (Dziewonski 1972: 73). The rank-size rule is also commonly referred to as Zipf's Law because the model describing a constant relation between the size of an event and its rank was at first developed by G. Zipf. In the case of cities distribution by population, when the natural logarithms of the rank and of the city size (in terms of the number of people) are calculated and

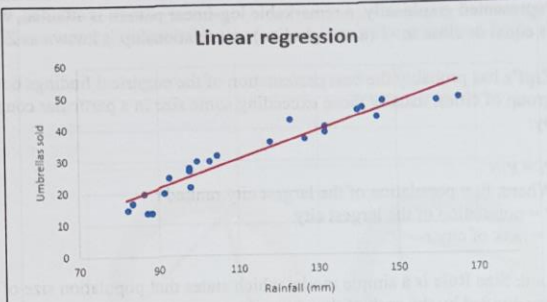


Figure: Example of linear regression. It is finding of the formula of the line (here in red) that would represent the best relationship between the variables. The regression line will demonstrate the relationship between the independent variable (rainfall) and dependent variable (umbrella sales)

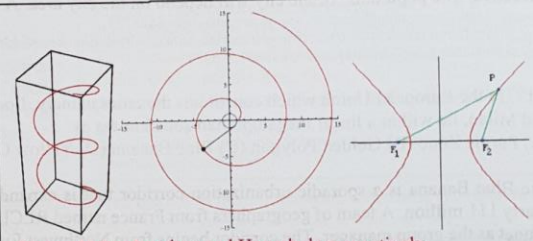


Figure: Helix, Involute and Hyperbola respectively



Figure: "A primate city as being at least twice as large to the next largest city, and more than twice as significant."
 ~ Mark Jefferson

Q18. An urban governance tool to mobilize financial resources by permitting additional FAR over and above the prescribed FAR by imposing a charge or fee for the same is known as
 (A) Betterment Levy (B) Impact Fee (C) Land Value Increment Tax (D) Floor Area Incentive Tax (Answer to all)

Q19. Identify the colour palette that is created using any three equally spaced hues around the colour wheel.
 (A) Split – complementary (B) Analogous (C) Triads (D) Complementary

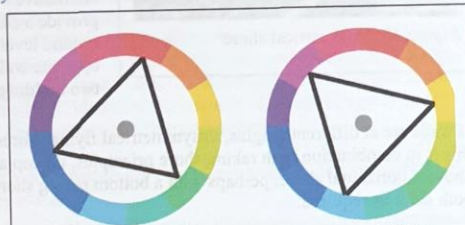
Q20. Coefficient of Performance (COP) for heat pump is used to calculate
 (A) the number of air changes. (B) the Energy Efficiency Ratio
 (C) the Energy Select Sector index. (D) the Indoor Air Quality index.

$$COP = \frac{\text{energy out}}{\text{energy in}}$$

Energy out, or the heat pump's expected output
 Energy In, or how much energy it takes to run the heat pump

The efficiency of refrigeration systems and heat pumps is denoted by its Coefficient Of Performance (COP). The COP is determined by the ratio between energy usage of the compressor and the amount of useful cooling at the evaporator (for a refrigeration installation) or useful heat extracted from the condenser (for a heat pump). A high COP value represents a high efficiency.

Most of the electric energy needed to drive the compressor is released to the refrigerant as heat. Therefore, more heat is available at the condenser than is extracted at the evaporator of the heat pump. (Source: https://industrialheatpumps.nl/en/how_it_works/cop_heat_pump/)



Red Green Blue
Triad Color Harmony

Cyan Magenta Yellow
Triad Color Harmony

Figure: Three colors that are evenly spaced on the Color Wheel form a Triad or Triadic Color Harmony. Two fundamental triad color combinations on an RGB Color Wheel are the Red, Green, and Blue (RGB) primaries and the Cyan, Magenta and Yellow (CMY) set used in printing. (Source: <https://medium.com/nightingale/three-way-color-in-a-donut-visualization-b22aad7b9617>)

Q21. Freight flows are converted to truck flows using
 (A) Volume factor (B) Weight factor
 (C) Payload factor (D) Distance load factor

Q22. Rebound hammer test is used to measure
 (A) permeability of concrete
 (B) bond stress between rebar and concrete
 (C) compressive strength of concrete
 (D) tensile strength of concrete

Q23. Which type of temporary supporting structure can be used in case of rebuilding the lower part of a load bearing wall at ground floor above plinth level? (A) Dead Shore (B) Pit Underpinning (C) Flying Shore (D) Needle Scaffolding

Q24. During earthquake, soft storey failure in a building is due to
 (A) shear failure initiated by short column effect.
 (B) stress discontinuity initiated by abrupt changes of stiffness.
 (C) failure of column initiated by weak column – strong beam effect.
 (D) drift of building storey initiated by pounding effect.

Shoring is the technique of using a temporary support, usually a form of prop, to make a structure stable and safe. It is often used to provide lateral support:

- To walls undergoing repair or reinforcement.
- During excavations.
- To prevent walls bulging out.
- When an adjacent structure is to be pulled down.
- When openings in a wall are made or enlarged.

There are three basic types of **shoring** system that can be used separately or in combination depending on the nature of the support required.

Raking shores involve inclined members, or rakers, typically placed at 3-4.5 m centres, and braced at regular intervals. They tend to be inclined at between 40-75°. Typical materials that are used include timber, structural steel, and framed tubular scaffolding.



Scan to watch on Youtube about the Rebound hammer test.

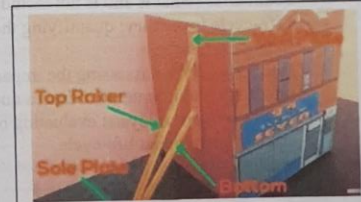


Figure: Raking shore
 (Source: civilconcept.com)



The IPCC provides regular assessments of the scientific basis of climate change, its impacts and future risks, and options for adaptation and mitigation

Created in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), the objective of the IPCC is to provide governments at all levels with scientific information that they can use to develop climate policies. IPCC reports are also a key input into international climate change negotiations. The IPCC is an organization of governments that are members of the United Nations or WMO. The IPCC currently has 195 members. Thousands of people from all over the world contribute to the work of the IPCC. For the assessment reports, IPCC scientists volunteer their time to assess the thousands of scientific papers published each year to provide a comprehensive summary of what is known about the drivers of climate change, its impacts and future risks, and how adaptation and mitigation can reduce those risks. An open and transparent review by experts and governments around the world is an essential part of the IPCC process, to ensure an objective and complete assessment and to reflect a diverse range of views and expertise. Through its assessments, the IPCC identifies the strength of scientific agreement in different areas and indicates where further research is needed. The IPCC does not conduct its own research.

In a recent publications, a series of special reports published over the last year, cover living on a planet with 1.5 degrees Celsius of global warming, and the effects of climate change on land, oceans and icy places.

In 2007, the IPCC was awarded the Nobel Peace Prize.

[Source: <https://www.ipcc.ch/about/>, <https://www.dw.com/en/what-is-the-ipcc-and-what-does-it-do/a-50552119>]

toe

Tonne of oil equivalent (toe) is a unit of energy, defined as the amount of energy released by burning one tonne (1000 Kilograms) of crude oil. The toe is used to describe large amounts of oil or natural gas in transport or consumption, and will often use a prefix of mega (1 000 000) in order to communicate this as Mtoe.

Mtoe

Millions of tonnes of oil equivalent (Mtoe) is a unit of energy used to describe the energy content of all fuels, typically on a very large scale. It is equal to 4.1868×10^{16} Joules, or 41.868 petajoules which is a tremendous amount of energy. The Mtoe is much smaller than the quad, but can be multiplied by 1000 in order to compare to it (1000 Mtoe = 1 Gtoe = 39.68 quad).

[Source: https://energyeducation.ca/encyclopedia/Tonne_of_oil_equivalent]

Green Building Rating Systems list in various countries

SN	Rating System	Full Form	Country	Year
1	BREEAM	Building Research Establishment's Environmental Assessment Method	UK	1990
2	BEPAC	Building Environmental Performance Assessment Criteria	Canada	1993
3	LEED	Leadership in Energy and Environmental Design	US	1998
4	PromiseE	The Finnish Environmental Assessment and Classification System	Finland	2002
5	BEAM Plus	Built Environmental Assessment Method	Hong Kong	2010
6	EcoEffect	-	Sweden	1997
7	GBA/GBTTool	Green Building Assessment (GBA)	Canada	1998
8	NABERS/ABGR	National Australian Built Environment Rating System/ Australian Building Greenhouse Rating system	Australia	1999
9	EEWH	-	Taiwan	1999
10	Eco-Quantum	-	Netherlands	1999
11	CG	Green Globes	Canada	2000
12	BEAT	Building Evaluation Assessment Tool	Denmark	2000
13	Ecoprofil	Ökoprofil	Norway	2000
14	CASBEE	Comprehensive Assessment System for Building Environmental Efficiency	Japan	2001
15	CASBEE	Comprehensive Assessment System for Building Environmental Efficiency	Hong Kong	2002
16	CEPAS	Comprehensive Environmental Performance Assessment Scheme	Korea	2002
17	KGBC	Korea Green Building Certification System	Australia	2003
18	GS	Green Star	India	2004
19	GRIHA	Green Rating for Integrated Habitat Assessment	France	2005
20	HQE	Haute Qualite Environment	Israel	2005
21	Si-5281	Israel Standard 5281: Building with Reduced Environmental Impact	Singapore	2005
22	GM	Green mark	America	2006
23	LBC	Living Building Challenge	America	2006
24	GPR	Green Point Rated	China	2006
25	ASGB	Assessment Standard for Green Building	Germany	2006
26	DGNB	Deutsche Gesellschaft Fur Nachhaltiges Bauen	UK	2006
27	CSH	Code for Sustainable Homes	Abu Dhabi	2007
28	EPRS	Estidama Pearl Rating System	Mexico	2008
29	SICES	Sustainable Building Rating Tool/Sistema de Calificación de Edificación Sustentable	America	2008
30	NGBS	National Green Building Standard	Brasil	2008
31	AQUA-HQE	Alta Qualidade Ambientale	Portugal	2008
32	LiderA	The Sistema de Acaliacao da Sustentabilidade (Certification System of Environmentally Sustainable Construction)	Italy	2009
33	ITACA Protocol	Protocollo Itaca	Malaysia	2009
34	GBI	Green Building Index	Philippine	2009
35	BERDE	Building for Ecologically Responsive Design Excellence	Qatar	2009
36	GSAS	Global Sustainability Assessment System	Spain	2009
37	VERDE	Herramienta VERDE	Egypt	2010
38	GPRS	Green Pyramid Rating System Levels		



Figure: Centre Georges Pompidou, Paris, 1971–77, Photo credit: Charles Leonard/Shutterstock.

Whitney Museum of American Art, New York (2015)
 Situated between the Hudson River and New York's High Line, Daniel Libeskind's Whitney Museum of American Art was designed to bring the gallery, which had been scattered in various buildings after outgrowing its Marcel Breuer-designed Madison Avenue home, back together on one site.



Figure: Whitney Museum of American Art, New York, 2015, Photography: Nic Lehoux4. The Menil Collection, Houston (1987)

California Academy of Sciences, San Francisco (2008)
 When it was completed more than a decade ago, Frank Gehry's California Academy of Sciences, signalled a significant development in sustainable architecture. Designed to be the greenest museum in the world, the building received LEED Platinum (the highest green standard in the US) and featured many elements which contributed to its eco-credentials.

The 37,000m² project, which includes exhibition space, research spaces, an aquarium and a planetarium, is designed as if a piece of park has been lifted up out of the ground. Its living roof circulates into a series of domes marking out the various spaces beneath, and contributing to the natural movement of air through the building.

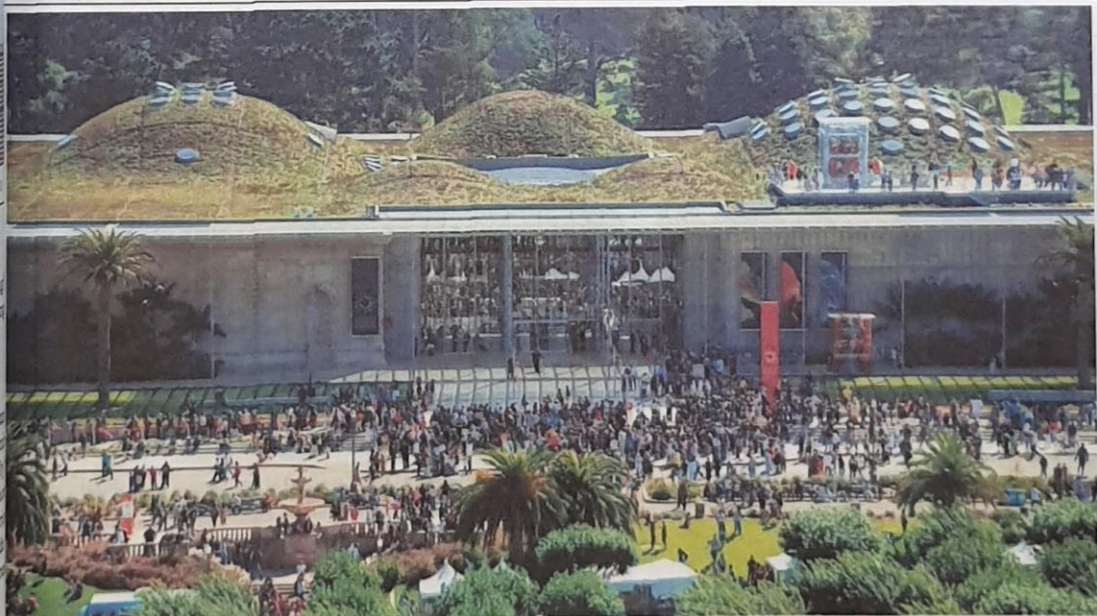


Figure: California Academy of Sciences, 2008, Photography: Shunji Ishida.

Centro Botin, Santander (2017)

Located in the Spanish city of Santander, the Centro Botin is a space for art, culture and education, and is Piano's first building in Spain. The 10,000m² project is split across two D-shaped blocks joined by an elevated glass and steel walkway that cantilevers over the sea. The building is clad in more than 280,000 round ceramic tiles which reflect the sunlight and the sea.



Figure: Centro Botin, Santander. Photo © Enrico Cano.

(Source: Renzo Piano Building Workshop <http://www.rpbw.com>, <https://www.royalacademy.org.uk/article/renzo-piano-8-buildings-to-know-shard>)



Figure: Daniel Libeskind



Figure: Royal Ontario Museum Rom in Toronto (2007) by Daniel Libeskind

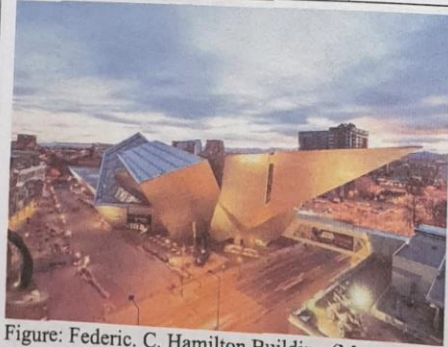


Figure: Federic. C. Hamilton Building (Museum, 2006), Denver, USA by Daniel Libeskind



Figure: Jewish Museum, Berlin (2001) by Daniel Libeskind

Figure: Museum of M by Daniel Libeskind

Q28. Match the heritage c

Group 1

- P. Washington
- Q. Florence Cha
- R. Venice Chart
- S. Burra Charter

The Washington Charter protection and conservation individual monument. It ad

- integration of pres
- qualities of histori
- participation of re
- the social and econ

The Florence Charter sets gardens as architectural con maintenance, conservation, features, and use of water. I legal and administrative issu specific class of cultural pro

The Venice Charter codifie forth principles of conservat context of a site or building. Venice Charter states that m the principles of preservatio

The Burra Charter is a nat Australia. The Charter is par cultural significance to mana the values and needs of a par

Q32 Match the temples in Group I with their style of Architecture in Group II

Group I	Group II	Options
P. Badami Cave Temples	1. Pandya style	(A) P-3, Q-1, R-2, S-5
Q. Kalugumalai Temple Complex	2. Chola style	(B) P-3, Q-4, R-2, S-1
R. Airavatesvara Temple	3. Chalukya style	(C) P-2, Q-1, R-3, S-5
S. Chennakeshava Temple	4. Vijayanagara style	(D) P-5, Q-1, R-4, S-2
	5. Hoysala style	

Badami Cave Temples: The city of Badami in Northern Karnataka, formerly known as Vatapi, was the capital of one of the greatest and most enduring dynasties in Southern India – the Chalukyas. There were three branches of the Chalukyas, the first of them being the 'Badami Chalukyas', who reigned from here from 543 – 753 CE.

The valley of the Mallaprabha (where Badami lies) and the Ghataprabha (both tributaries of the Krishna river) formed the very fertile heart of the farmed based economy of this early empire. Nestled in an imposing ravine that cuts through the heart of the sandstone landscape by the Mallaprabha, the site is graced by some beautiful rock-cut temples that are remnants of a bygone era.

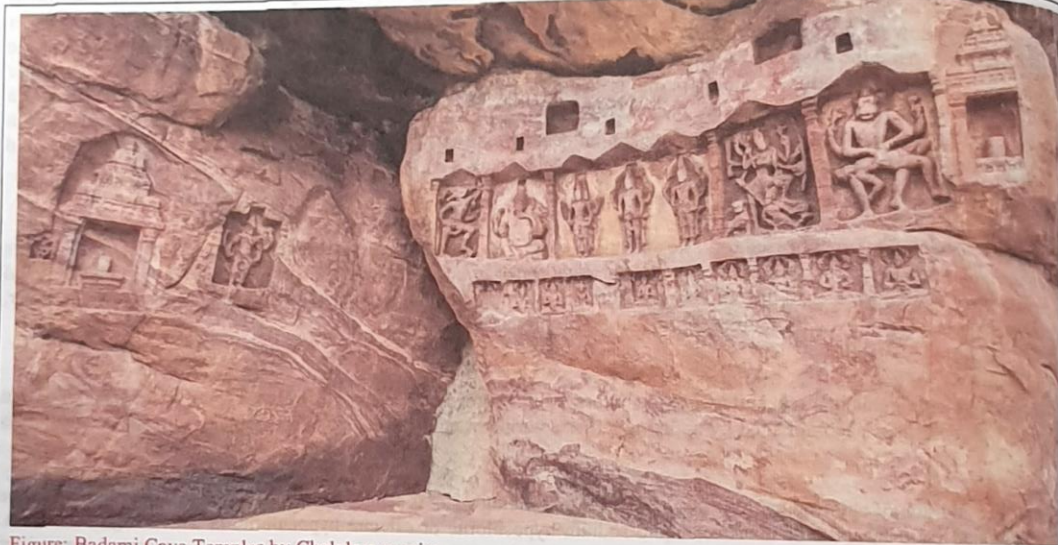


Figure: Badami Cave Temples by Chalukya empire

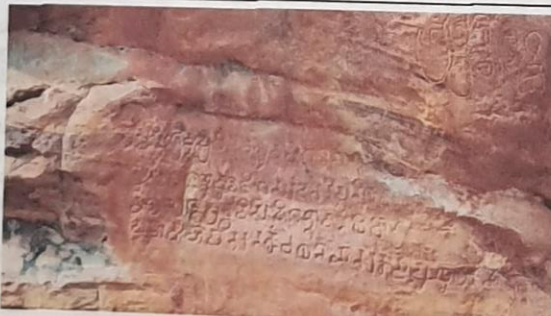


Figure: Old Kannada inscription of Chalukya King Mangalesha dated 578 CE at Badami Cave 3

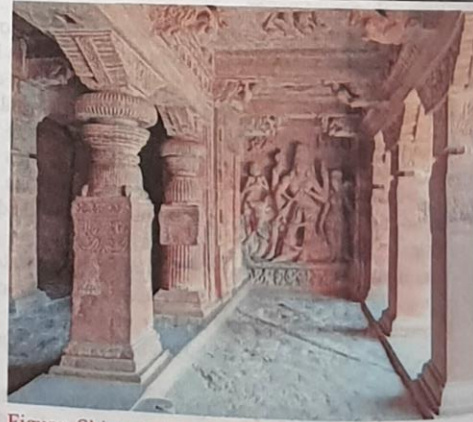


Figure: Shive sculpture and engraved pillars in cave no.

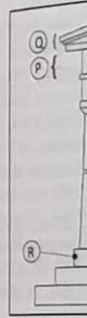
Q33. Match the urban form/structure in Group I with their respective proponents in Group II.

Group I	Group II	Options
P. Trabantenstadte	1. Arturo Soria Y Mata	(A) P-4, Q-1, R-5, S-3
Q. Linear city	2. Le Corbusier	(B) P-5, Q-1, R-4, S-2
R. Bloomsbury Precinct	3. Ernst May	(C) P-3, Q-1, R-5, S-2
S. Radiant city	4. Frank Lloyd Wright	(D) P-3, Q-4, R-1, S-2
	5. Patrick Abercrombie	

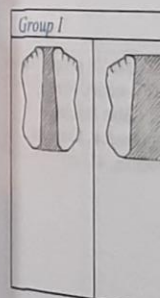
Arturo Soria Y Mata: The... but was promoted by the... enterprises and schools in... appearance was in an article... a radical measure for the f... long of the strip would be... strip, the main actor would... building exclusively for m... that the cities should ad... grouping of building in... rural life, this is the proble... implying the lack of attent... that this perpetuate the con...

Ernst May (Germany city... on open land outside... May combined uncompro... set... May's "brigade" of Ger... successfully applied urban... twentieth century". (Source:...

Q34. Match the elements in



Q35. Match the position of



Q36. Match the buildings in

- Group I
- P. Empire State
 - Q. John Hancock
 - R. Taipei 101
 - S. Sears Tower

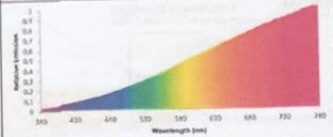
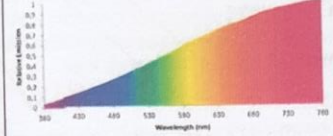
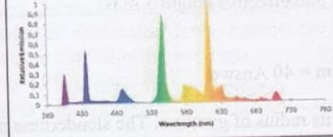
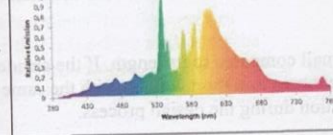
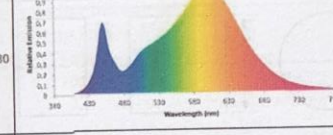
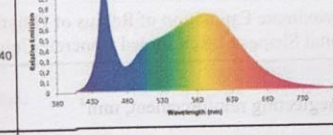
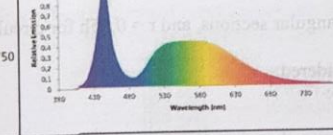
Description	Spectrum	Lamp or module luminous flux, measured (lm)	Observed luminous efficacy (lm/W)	Energy conversion efficiency	Theoretical maximum luminous efficacy (lm/W)
High voltage halogen, 120 W		2249	17.7	11.9	148.7
Low voltage halogen, 60 W		1535	25.6	15.4	166.3
Fluorescent lamp T 5, 54 W, 830		4184	81.6	23.7	344.4
Metal halide lamp, 70 W, 830		7912	99.2	31.5	314.5
LED, 35 W, 830		4739	138.6	42.3	327.6
LED, 35 W, 840		4806	139.3	43.7	318.8
LED, 16 W, 750		2436	150.5	48.7	309

Figure: The table shows observed and the theoretical maximum luminous efficacy of different spectra.

From the table we can see that the typical spectrum of a warm white LED achieves a theoretical module luminous efficacy of approx. 320 lm/W. However, since the assumption is that there is loss-free conversion of physical radiated power into the wavelengths of the spectrum, then the actual realisable module luminous efficacy is much smaller. In future it may be possible to achieve system luminous efficacy in the range of 200–250 lm/W.

In addition, the overview shows energy conversion efficiency of the lamps examined. The energy conversion efficiency describes how much of the power is converted into visible light. In this respect efficient LEDs are clearly well ahead of conventional lamps. While energy conversion efficiency of incandescent lamps, for example, is between 10% and 20%, very efficient LEDs at present achieve values between 40% and 50%. Nevertheless, this is still only 40 – 50%, so 50% to 10% of the power is lost as heat.

Source: <https://www.dial.de/en/blog/article/efficiency-of-leds-the-highest-luminous-efficacy-of-a-white-led/>



Scan for reading about efficacy of lamps.

GATE 2020

Numerical Questions:

Q1. The difference between the sum of the first $2n$ natural numbers and the sum of the first n odd natural numbers is
 (A) $2n^2 + n = 36$ (B) $n^2 - n = 12$ (C) $2n^2 - n = 28$ (D) $n^2 + n = 20$

Solution: Sum of the first $2n$ natural numbers is:

$$1 + 2 + 3 + \dots + 2^n = \frac{2(n)(2n+1)}{2} = 2n^2 + n$$

Sum of the first n odd natural numbers is:

$$1 + 3 + 5 + \dots + 2(n-1) = n^2$$

So, required difference = $2n^2 + n - n^2 = n^2 + n$ Answer. So, correct option is (D)

For student of architecture, the above formulae may not help as not frequently used. We will solve the above question by taking an example.

Let, $n = 4$

So, first $2n$ natural numbers = first 2×4 natural numbers = first 8 natural numbers
 = 1, 2, 3, 4, 5, 6, 7, 8

So, Sum of first $2n$ natural numbers = $1+2+3+4+5+6+7+8 = 36$

First n odd natural number = First 4 odd natural numbers (because $n=4$) = 1, 3, 5, 7

So, sum of first n odd natural numbers = $1+3+5+7 = 16$

Therefore, the difference between = $36 - 16 = 20$ (e)

Now, we will check which of the given four options gives answer 20 when $n = 4$.

(A) $2n^2 + n = 36$ (B) $n^2 - n = 12$ (C) $2n^2 - n = 28$ (D) $n^2 + n = 20$

So, as per equation (e), the correct option is (D) $n^2 + n$ Answer

Q2. The profit shares of two companies P and Q are shown in the figure. If the two companies have invested a fixed and equal amount every year, then the ratio of the total revenue of company P to the total revenue of company Q, during 2013 - 2018 is _____.

- (A) 16 : 17 (B) 17 : 16
 (C) 17 : 15 (D) 15 : 17

Solution: Suppose Rs. X is invested every year by Company P and Company Q.

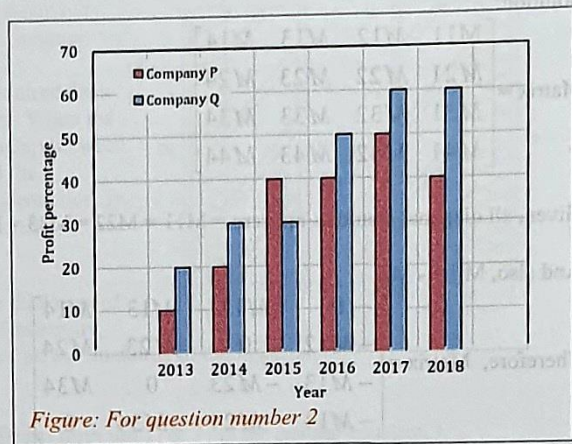
The total revenue by P from 2013 - 2018 is:

$$\frac{x}{100} * [110 + 120 + 140 + 140 + 150 + 140] = 8x$$

The total revenue by Q company from 2013 - 2018 is:

$$\frac{x}{100} * [120 + 130 + 130 + 150 + 160 + 160] = \frac{17x}{2}$$

So, Required ratio is $8x : \frac{17x}{2} = 16:17$ Answer



Q3. P, Q, R, S, T, U, V. and Ware seated around a circular table.

- I. S is seated opposite to W.
- II. U is seated at the second place to the right of R.
- III. T is seated at the third place to the left of R.
- IV. V is a neighbour of S.

Which of the following must be true?

- (A) Q is a neighbour of R.
- (B) P is not seated opposite to Q.
- (C) R is the left neighbour of S.
- (D) P is a neighbour of R.

Solution: From the given data, we have following diagram:
 So, P is not seated opposite to Q.

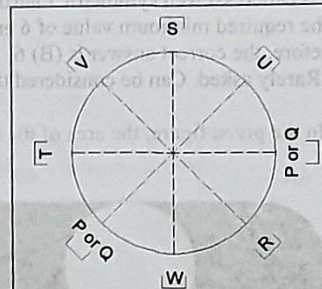
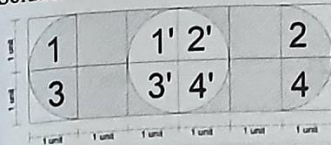


Figure: Answer to question number 3

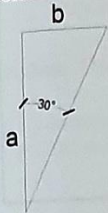
Solution:



Here, Area of region 1 = Area of void region 1' and so on.
Therefore, area of the shaded portion = 8 units Answer.

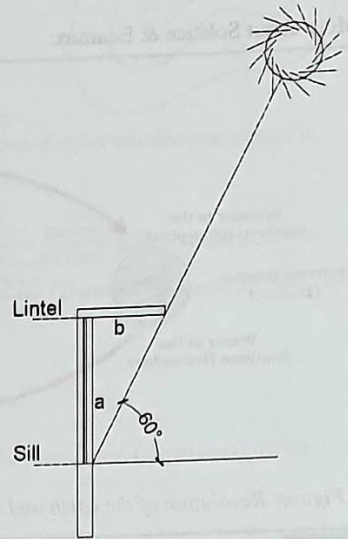
Q7. A 1.2 m high window is located on a south facing wall. The solar azimuth angle is equal to the wall azimuth angle and the solar altitude angle is 60°. The minimum depth (in metres, rounded off to two decimal places) of overhang required to completely shade the window is _____.
(Assume that the overhang is located at the lintel level of the window)

Solution:



$$\tan 30^\circ = \frac{b}{a} = \frac{b}{1.2}$$

$$\Rightarrow b = 0.69 \text{ Answer}$$



Official GATE answer range: 0.68 to 0.70

Q8. For the same thickness of material layers, relative position of insulation in the wall sections 1 and 2 shown below will have an impact on

- (A) Thermal Time Constant
- (B) Thermal Resistivity
- (C) Thermal Transmittance
- (D) Thermal Conductivity

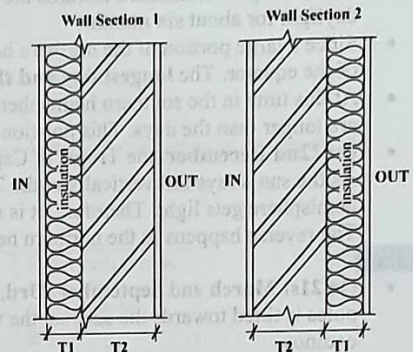
Solution: The **Thermal Time Constant** indicates a time required for a thermistor to respond to a change in its ambient temperature. When the ambient temperature is changed from T1 to T2, the relationship between the time elapsed during the temperature change t (sec.) and the thermistor temperature T can be expressed by the following equation. [τ (tau in sec.) in the equation denotes the thermal time constant.]

$$T = (T_2 - T_1) (1 - \exp(-t/\tau)) + T_1$$

Please note that the above equation does not depend on the thickness of the material. But when we look at the formula of Thermal Resistivity, Thermal Transmittance & Thermal Conductivity, all depend on the thickness of the material.

So, the correct option is (A) Thermal Time Constant.

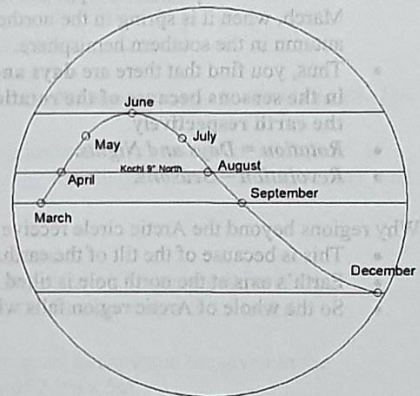
(Please also note that T1 & T2 in the question figure is different from the T1 & T2 in the answer equation.)



Q9. The solar altitude angle on April 16 at 7:00 AM in Kochi is 16°. The same solar altitude angle will occur at the same time in the same year at the same location on

- (A) October 21
- (B) July 21
- (C) August 27
- (D) September 23

Solution: March and September, we have Equinox. June and December we have summer and winter solstice. It means during June, the sun has direct rays on tropic of cancer in Northern hemisphere. And in the same way during Dec it will be on tropic of Capricorn in Southern hemisphere. So if the sun starts moving slowly towards tropic of cancer from March to June. It will go via Kochi (which is northern hemisphere) on April (one month after equinox) so then after reaching June Solstice it will



Q18. Plan and section of an isolated foundation is given below. The volume of concrete up to Ground Level (GL) (in m³, rounded off to two decimal places) is _____.

Solution: Let's divide the foundation in 3 parts.

Part I: Rectangular base with height 0.4m

Part II: Slant base with height 0.5m

Part III: Column part with height 1.1m

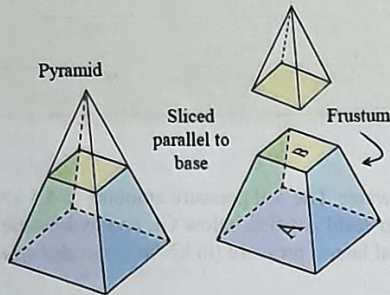
Part I, Volume = Base area * 0.4m = (2m x 2.5m) * 0.4 = 2m³

Part II, Volume = Average base area * 0.5m = $\frac{(2m \times 2.5m) + (0.4m \times 0.5m)}{2} * 0.5m = 2.51m^2 * 0.5m = 1.23 m^3$

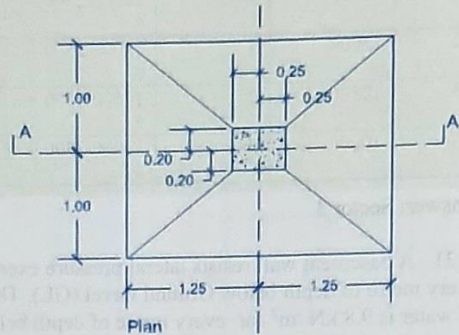
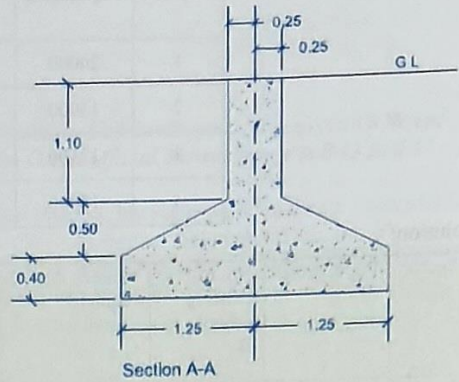
Part III, Volume = Column cross sectional area * 1.1m = (0.4m x 0.5m) * 1.1m = 0.22 m³

Total volume = 2 + 1.23 + 0.22 = 3.43m³

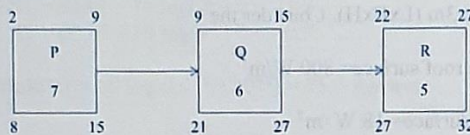
Please note that volume of the Part II is not accurate (Average area used for faster calculation). It is actually a frustum.



Volume of Frustum = $\frac{1}{3} * h * (A + B + \sqrt{AB}) = \frac{1}{3} * 0.5 * (5 + 0.2 + \sqrt{5 * 0.2}) = \frac{1}{3} * 0.5 * 6.2 = 1.03 m^3$
 Official GATE answer range is 3.1 to 3.4



Q19. The activity duration, early start, early finish, late start and late finish of the three activities 'P', 'Q' and 'R' are shown in the following figure. The independent float of activity 'Q' is



Solution: Independent Float

= ES of succeeding activity - LF of preceding - Duration of the activity of which Independent float is to be counted

= ES of R - LF of P - Duration of Activity Q

= 22 - 15 - 6

= 1 Answer

Scan for pdf on Total, Free, Independent & Interfering float.

Scan for video lecture on Total float & Free float.

Scan for video lecture on Independent float

Figure: Scan for explanation on YouTube for Independent Float

Q20. A population of 2500 persons requires a minimum area of 3000 m² for primary schools. For the population in four different sectors given in the table below, the Sector having maximum shortage of school area per person is _____.

Q31. Repo rate is the rate at which Reserve Bank of India (RBI) lends commercial banks, and reverse repo rate is the rate at which RBI borrows money from commercial banks.

Which of the following statements can be inferred from the above passage?

- (A) Increase in repo rate will decrease cost of borrowing and decrease lending by commercial banks.
 (B) Decrease in repo rate will decrease cost of borrowing and increase lending by commercial banks.
 (C) Decrease in repo rate will increase cost of borrowing and decrease lending by commercial banks.
 (D) Increase in repo rate will decrease cost of borrowing and increase lending by commercial banks.

Q32. Shyam-Rai temple of Bishnupur in West Bengal, is an example of

- (A) Pancha-ratna type terracotta temple (B) Stone carved Dravidian type temple
 (C) Nava-ratna type terracotta temple (D) Stone carved Nagara type temple

Notes: Made of bricks, with square-shaped towers at the corners, the Shyam Rai Temple is massive in terms of its scale and embellishments. It was built by king Raghunatha Singh (1702-1712) of Mallabhum, in 1643, to honour Lord Vishnu in his form as Lord Krishna. It is built in the **Panchratna Architectural style (in which five pillars stand on the roof)** and is probably the state's oldest temple reflecting this design. One can also catch a few glimpses of the Gandhar style (Buddhist art) on the walls. The artists have displayed remarkable skill and craftsmanship in intricately engraving designs on the baked bricks to make the temple. The four sides of the temple are followed by arched gateways leading to the sanctum. The temple has figurines and floral motifs, which were the first of its kind in the state. The inner and outer walls, along with the ceiling, are adorned with **terracotta sculptures depicting Krishna leela and episodes from great Indian epics like Ramayana and Mahabharata.** Answer (A)

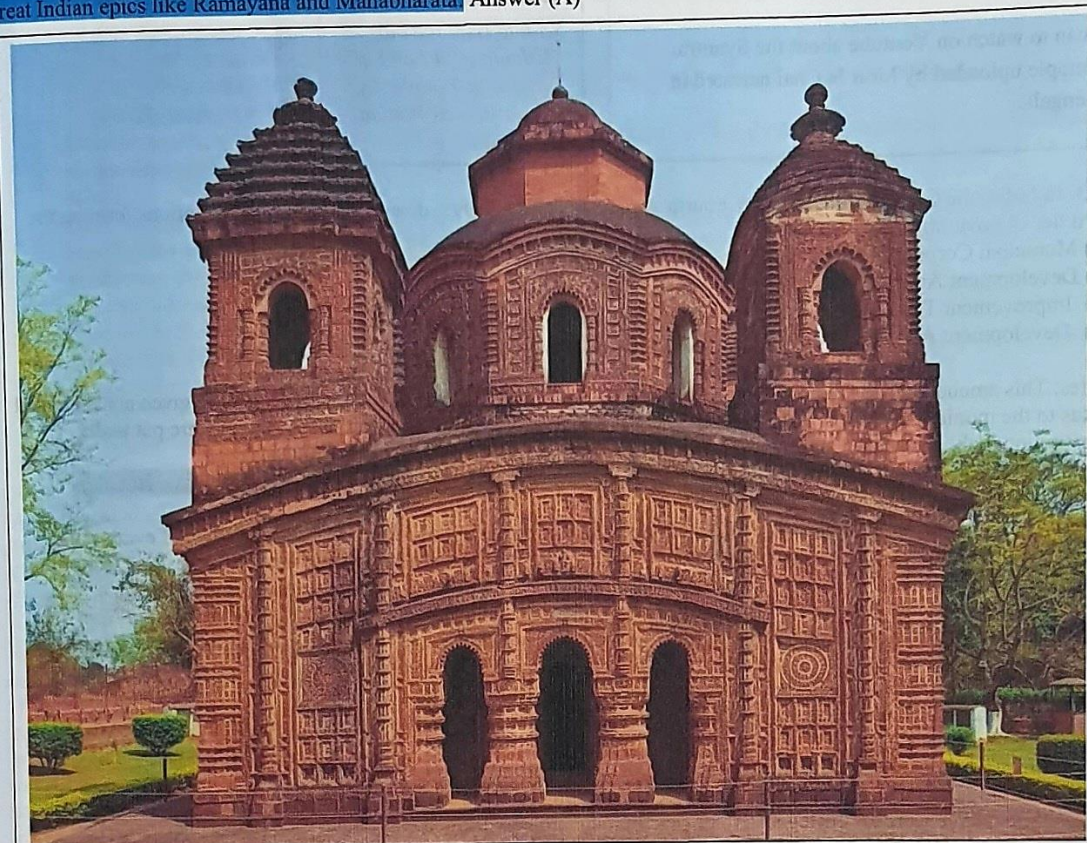


Figure: Shyam Rai Temple, Bishnupur, West Bengal. It is built in the Panchratna Architectural style (in which five pillars stand on the roof). Four pillar stands at four corners and one at the centre. The word Panchratna means Panch = five & Ratna = Gems.

Q35. As on 2018, 'Right to Property' in India is a
 (A) Constitutional Right (B) Tertiary Right (C) Secondary Right (D) Fundamental Right

Notes: The right to property is not a Fundamental Right but it is a constitutional right. In the original Constitution the right to property was listed as a fundamental right. By the 44th Amendment to the Constitution, the right to property was removed as a fundamental right and instead, a new provision was added to the Constitution i.e. Article 300-A making it a constitutional right.

The 'Right to Property' was initially the Fundamental Right but it caused many issues and then converted into Constitutional Right. Why was this done so? An insightful answer by Prateek Singotiya on Quora.com is given below:

Right to property as a fundamental right was guaranteed by Article 19(1)(f) and 31.

Article 19(1)(f) gave every citizen a right to acquire, hold and dispose her property. Whereas article 31 ensured that any person (citizen + foreigners) cannot be deprived of her property except by authority of law. It also mentioned that state can acquire property only for public purposes and in return of which compensation had to be paid.

But India's economic structure was still dominated by zamindar, big landlords etc. Freedom fighters were committed to land reforms to bring justice to poor people. It was perhaps a necessary action to lift people from poverty. So govt started bringing legislations, such as land ceiling act (a person cannot own land above a certain limit, excess land will become a govt property, which would be distributed among poor people), zamindari abolition, tenancy regulation etc.

But this act of govt was challenged in the court as it violated fundamental right to property of some sections of people. The supreme Court being the guarantor of fundamental right generally ruled in favor of property holders. This had created a paradoxical situation, a new question emerged, should the directive principles of state policy prevail over fundamental rights or not? Should the welfare prevail over fundamental rights? Under directive principles, it is the moral duty of the govt to take action for welfare of people.

The confrontation between parliament and judiciary started, and it became more aggressive later.

To nullify Court's order, parliament had to enact multiple constitutional amendment acts- 1st, 4th, 25th, 39th, 40th, 42nd etc. It finally paved a way forward for land reforms. But still, there was possibility of many challenges in future, as the root cause of the issue was still not addressed. Parliament has just cured from symptoms but not the disease. Therefore, in 1978, it abolished right to property as a fundamental right and removed article 19(1)(f) and 31 out of part III of constitution.

Right to property was now no more a fundamental right but it was made a legal right well within the constitution itself, by inserting article 300A in part XII. Now if this right is violated, the aggrieved person cannot approach to supreme Court directly, but he can move to high courts. This right can now be regulated, abridged even by an ordinary law.
 Answer (A)

Q36. In the architectural style of ancient North Indian Temples, the term 'Adhithana' refers to
 (A) Base Platform (B) Vestibule (C) Pinnacle (D) Transept



Scan to read the blog
 'Temple architecture –
 Devalaya Vastu' by
 Sreenivasa Rao at
sreenivasaraos.com

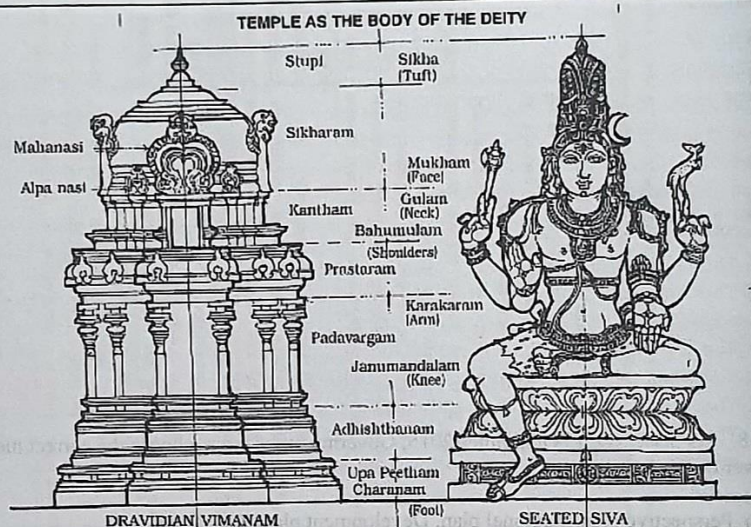


Figure: The nomenclature 'Adhishthanam' fits with most of the form of Temple Architecture. Answer (A)
 Image Source: sreenivasaraos.com



Figure: Plan of Shyam Rai Temple, Bishnupur. This brick-built Temple is situated within the fort and consists of a square roof surmounted by five towers and is thus an example of Panchratna type. The central tower itself is octagonal enclosed by an octagonal corridor. The temple is the most profusely carved temple in Bishnupur. Inscription records erection by Raghunatha Singha in 1643 AD. Source: asikolkata.in/bankura.aspx



Scan to watch on Youtube about the Syamrai Temple uploaded by Mon Ja Chai narrated in Bengali.



Scan to read the blog 'Bishnupur: A Land of Terracotta Temple' by Ayeeta Biswas Paul at sahapedia.org

Q33. In India, the Constitution (Seventy Fourth Amendment) Act, 1992, delegates powers to institutions forming the third tier of government, which are:

- (A) Municipal Corporation, Municipality and Nagar Panchayat
- (B) Development Authority, Improvement Trust and Panchayat
- (C) Improvement Trust, Nagar Panchayat and Panchayat
- (D) Development Authority, Municipal Corporation and Municipality

Notes: This amendment, also known as **Nagarpalika Act**, came into force on 1st June 1993. It has given constitutional status to the municipalities and brought them under the justifiable part of the constitution. States were put under constitutional obligation to adopt municipalities as per system enshrined in the constitution.

Definition of Metropolitan area: **Metropolitan area in the country is an area where population is above 10 Lakh** (Article 243P)

Three Kinds of Municipalities: Article 243Q provides for establishment of 3 kinds of Municipalities of every state.

- **Nagar Panchayat:** A Nagar Panchayat is for those areas which are transitional areas i.e. transiting from Rural Area to Urban areas. "Governor" will by public notice, will define these three areas based upon the population, density of population, revenue generated for local administration, % of employment in Non-agricultural activities and other factors. Further, a Governor may also if, he fits it necessary, based upon industrial establishments, can specify the Industrial Townships by public notice.
- **Municipal Council:** A Municipal council is for smaller urban area
- **Municipal Corporation:** A municipal Corporation for Larger urban Areas

Background of the Constitution (Seventy - Fourth Amendment) Act, 1992

The Constitution of India has assigned the subjects pertaining to the urban areas to the State Legislates. In so far as urban issues are concerned, the legislative powers of the Union are limited only to the following subject/areas:

- Delhi and other Union Territories
- Property of the Union
- A subject of the state list which two or more state legislatures authorise Union Parliament to legislate.
- Amendment of the Constitution of India.

Constitution (Seventy-Fourth Amendment) Act 1992 is a revolutionary piece of legislation by which Constitution of India was amended to incorporate a separate Chapter on urban local bodies, which seeks to redefine their role, powers and finances. The salient features of this Act are:

- Urban local bodies, to be known as Municipal Corporations, Municipal Councils and Nagar Panchayat depending on the population, shall be constituted through universal adult franchise in each notified urban area of the country.

GATE 2

These shall be constituted for...
be completed before the expiration...
Not less than one-third of total nu...
The Legislature of a State may by...
enable them to function as institu...
The Twelfth Schedule of the Con...
1. Urban Planning including...
2. Regulation of land-use an...
3. Planning for economic ar...
4. Roads and bridges.
5. Water supply for domesti...
6. Public health, sanitation...
7. Fire services.
8. Urban forestry, protection...
9. Safeguarding the interests...
retarded.
10. Slum improvement and u...
11. Urban poverty alleviation...
12. Provision of Urban ameni...
13. Promotion of cultural, ed...
14. Burials and burial ground...
15. Cattle pounds; prevention...
16. Vital statistics including...
17. Public amenities includin...
18. Regulation of slaughter h...
• In order that the urban local bodie...
assign them specific taxes, duties...
same.
• Each State shall also constitute a...
local bodies and recommend the p...
in-aid from the Consolidated Fun...
• The superintendence, direction an...
elections to the urban local bodie...
• In each district a District Planning...
and rural local bodies.
• Similarly for each metropolitan a...
development plan for the metropo...

- Q34. 'Tendon' is primarily used
- (A) to prepare a tender document
 - (B) as a compression member
 - (C) to pre-stress concrete
 - (D) as roof sheathing

Notes: **Prestressed Concrete:** Although concrete was patented by a San Francisco...
1866, it did not emerge as an accepted b...
material until a half-century later. The s...
in Europe after World War II coupled w...
technological advancements in high-str...
and steel made prestressed concrete the...
material of choice during European pos...
reconstruction. North America's first p...
in Philadelphia, the Walnut Lane Me...
completed until 1951.

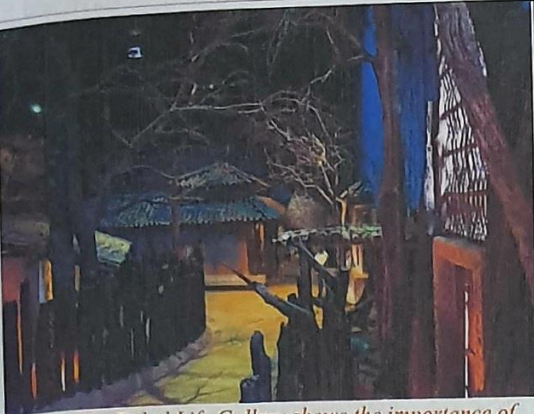


Figure: The Tribal Life Gallery shows the importance of everyday things like having a tree in the courtyard and cattle inside the premises. – © Michael Turtle

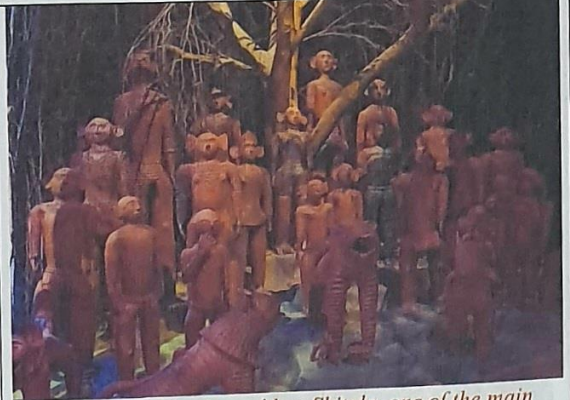


Figure: Shrines for the goddess Shitala, one of the main deities of the Bastar region, who protects villages from diseases and other troubles. – © Michael Turtle

Cholamandal Artists' Village, Chennai

Cholamandal Artists' Village, established in 1966, is the largest artists' commune in India, whose artists are credited for the Madras Movement of Art, which brought modernism to art in the South India. It has earned reputation world over and is now, one of the major tourist attractions in the Coastal city. The initial design was made by a visiting Dutch couple, the design for the art centre was made by architects Sheila Sri Prakash of Shilpa Architects and M. V. Devan. The original Artists Handicrafts Association is still in charge of the colony, and Paniker's son, sculptor S. Nandagopal, is the secretary of the village. Out of the original 40 artists, many are no more, and some have moved out, only 21 remain today. This co-operative artists colony started as a joint effort of more than 30 painters and sculptors. The creative work is happening there in an ongoing basis and all the paintings by different artists ranging from classical to modern art are displayed for viewing and for sale also. This is the first of its kind in the world where a colony of artists are formed in an excellent ambiance on the shores of Bengal sea.



Scan this to go to
learn about architect
Sheila Sri Prakash

Q51. Match the plant forms in Group I with the botanical names in Group II, as per 'A Handbook of Landscape', CPWD 2013, Government of India

Group I	Group II
(P) Columnar	(1) <i>Pinus roxburghii</i>
(Q) Globular	(2) <i>Ipomoea grandiflora</i>
(R) Weeping	(3) <i>Juniperus chinensis</i>
(S) Pyramidal	(4) <i>Salix babylonica</i>
	(5) <i>Mimusops elengi</i>

- (A) P-3, Q-4, R-2, S-1 (B) P-1, Q-3, R-4, S-5 (C) P-3, Q-5, R-4, S-1 (D) P-1, Q-5, R-2, S-3

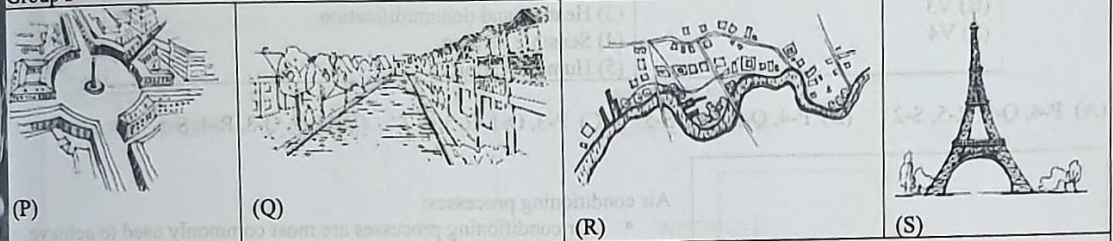
Juniperus chinensis, commonly called Chinese juniper, is a dioecious evergreen conifer that is native to China, Japan, Mongolia and the Himalayas. It is often seen in the wild as a conical tree to 50' tall and 20' wide, but also appears in much shorter shrubby or spreading forms. Foliage is dark green. Brown bark on mature stems peels in strips. Although species plants are rarely sold in commerce, a large number of cultivated varieties ranging in size from large trees to large/small shrubs to low-growing groundcovers have become popular ornamental landscape plants. Chinese juniper leaves come in two types: scale-like (adult) and awl/needle-like (juvenile). Cones (pollen and seed-bearing) appear on different plants. Male plants produce catkin-like pollen cones. Female plants produce fleshy, berry-like, whitish-blue seed cones that usually acquire violet-brown tones as they mature over two years.



Figure: Abstract proportions and primary colours of the Gerrit Rietveld-designed Schröder House in Utrecht. The house was awarded protected UNESCO World Heritage status in 2000.

Q56. Match the graphical representations in Group I with corresponding elements in Group II

Group I



Group II (1) Pathway (2) Node (3) District (4) Edge (5) Landmark

- (A) P-1, Q-2, R-3, S-5 (B) P-4, Q-1, R-3, S-2 (C) P-2, Q-3, R-4, S-5 (D) P-2, Q-1, R-4, S-5

The City Image and Its Elements – Kevin Lynch

Kevin Lynch was an American urban planner and author. His ideas about city and its perception can be seen in his work 'The Image of the City.' Which I will try to summarize in this post.

According to Lynch, the city is about the way the people perceive it. He called it as imageability. Some elements in the city gives people more than only information. In the book those elements called as paths, edges, districts, nodes and landmark.

First element that is mentioned is paths. Paths are the channels that helps observer to move along to city. They can be streets, canals, railroads or so on. Paths are linear and continuous channels. They are important since the way we observe city depends on the ways we walk.

Second element is edges. He basically defined edges as a boundary of two phases. They are linear elements that in between city and sea for example. Opposite from the paths, the edges broke the continuity of a phases and from the edges there is another phase that began.

Third one is districts. It is like the sections of the city. The observer can go inside of the districts. Districts can be defined with different

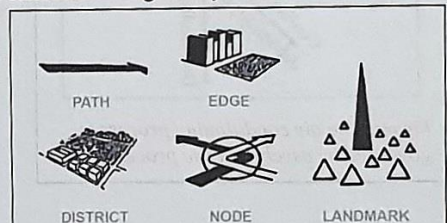


Figure: This famous depiction is called imageability. A city is known by this 5 elements as per Kevin Lynch



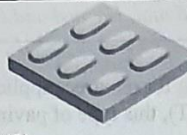
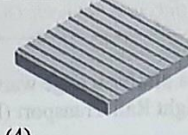



Scan this to go to illinois.edu and learn about the 3D visualization of the Hypars)

Hypars

We use the term **hypar** to mean a hyperbolic paraboloid shape, or more formally a partial hyperbolic paraboloid, cut from the full infinite surface. The term hypar was introduced by the architect Heinrich Engel in his 1967 book *Structure Systems*

Q60. Match the names of tactile paving in **Group I** with their patterns in **Group II**

Group I	(P) Lozenge	(Q) Offset blister	(R) Corduroy	(S) Directional	
Group II	 (1)	 (2)	 (3)	 (4)	 (5)

- (A) P-4, Q-2, R-3, S-1 (B) P-3, Q-5, R-4, S-1 (C) P-2, Q-5, R-1, S-4 (D) P-3, Q-2, R-4, S-1

Tactile Paving

The key element with tactile paving is that different surface profiles are intended to denote different hazards, and these are outlined below.

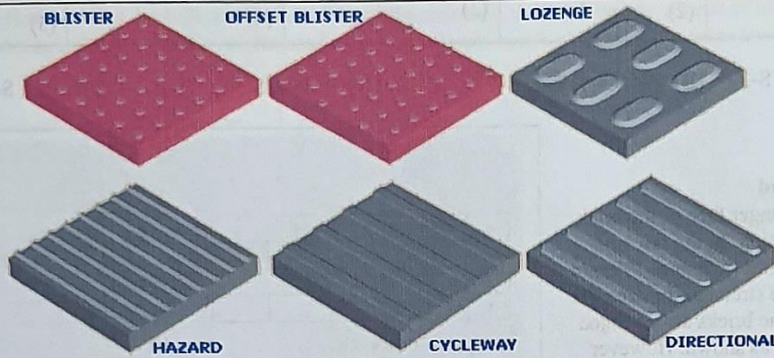


Figure: There are mainly six types of Tactile Pavings.

There are two types of Blister paving: the most common type features 6mm high 'blisters' in a square pattern and these are used to indicate pedestrian crossings with dropped kerbs.

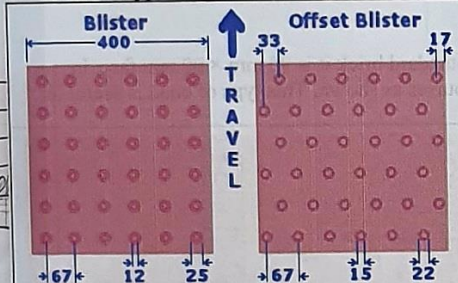


Figure: There is slight difference in the layout of blisters that makes Blister and Offset Blister paving distinct.

Normally, the red-coloured units are used with light-controlled crossings, and buff for those crossings with no traffic lights. However, when natural stone units are used, this colour-coding is disregarded.

The Offset Blister units are used to indicate the edge of the platform at Rail and Tram stations, also referred to as off-street applications. Note that the orientation of the offset blister units is critical - the rows of blisters MUST be parallel to the platform edge, and they are generally placed approximately 500mm back from the edge.

Hazard Warning units use continuous half-rods, raised 6mm higher than the surface of the paving, to denote a hazard, such as the top/bottom of a flight of steps. Again, the rods should be parallel to the edge of the hazard.

André Le Nôtre is known for the finesse of his formal flowerbed compositions and for optical illusions without precedent. The use of large, sweeping perspectives allows for **impressive panoramas**. In reality, however, it's nearly impossible to see the Versailles domaine all at once, a fact which bears witness to the talent of Le Nôtre. Indeed, thanks to a series of flat parterres the gardens unveil themselves with every step. As a result, as the visitor advances so does the landscape reveal itself slowly but surely, much like the succession of theatre scenes that end up creating a complete story.



Figure: Jardins de Vaux le Vicomte, created by Le Nôtre. The embroidery parterre, or a formal flowerbed garden, is a theme specific to French gardening that harks back to a veritable tradition. This type of garden is geometric in nature and traces symmetric, *arabesque* lawns in front of buildings. There's no such thing as a French-style garden without an embroidery parterre! Those that currently exist at Versailles are reconstructed ones that date from the 1920s and are therefore not entirely faithful to the originals. Old etchings show that rather than lawns bordered by a hedge of small bushes, as is the case today, parterres were the outlines of lawns traced directly onto gravel.



 **YouTube**

Scan to watch on
Youtube to learn
more about The
Gardens of
Versailles.

most famous and influential
on every side from a terrace
the terrace is the Latona Fountain
main depicts the events of the

A geodesic dome consists of a network of triangles that are joined together to create a roughly spherical surface. If a sufficiently large number of triangles are used, the geodesic dome approximates a true sphere. Furthermore, different sized triangles allow the geodesic dome to be divided symmetrically by 31 different great circles. A great circle is the largest circle that can be drawn around a sphere. On Earth, for example, the equator represents the only latitude line that is a great circle. On the other hand, all longitude lines are great circles. Because of these properties of symmetry, geodesic domes get their name from the Latin word *geodesic*, meaning "Earth-dividing".

The benefits of a geodesic dome structure can be realized by examining the properties of a sphere. For example, a sphere represents a shape that has the highest volume to surface area ratio. This means that material costs can be minimized without sacrificing interior space. Furthermore, a half-sphere (the shape used for most residential domes) allows for a maximum amount of floor space for a given surface area. Compared with a traditional 1500 square foot dome, a 1500 square foot geodesic structure (with a 23-foot high ceiling) uses almost 20% less building materials. Since they have less surface area, geodesic domes are able to reduce heating costs by as much as 50% when compared with traditional buildings. Because the spherical shape also tends to absorb the most external light, additional energy savings can be realized by reducing the need for artificial lighting.



Figure: Expo 67 in Montreal, Quebec, Canada. The museum's geodesic dome was designed by Buckminster Fuller.

Photo credit - *aquigabo!*

<https://www.flickr.com/photos/138047837@N02/24356393675/sizes/l>

Geodesic domes are extremely stable structures. This is partly due to the fact the triangles, which are naturally stable polygons, are used throughout. This is one of the reasons triangles are so popular in homes, buildings, and bridges. In a geodesic dome, these triangles eliminate the need to include load-bearing walls without sacrificing stability. In addition, its curved surface offers a natural layer of protection from high winds and other environmental stresses. Geodesic domes have been used in such places as Antarctica where wind speeds can reach 200 miles per hour. Bucky Fuller built many domes using geodesic principles, including a 250-foot diameter dome for the 1967 World's Fair in Montreal, Canada. Answer (C)

Q.39 The abrupt change or junction between two ecological zones is termed as

- (A) Ecological niche (B) Ecosystem (C) Ecotype (D) Ecotone

Notes: An ecotone acts as the boundary or barrier between two biomes. It is the area where two distinct types of environments merge and blend.

Ecotones could be the border where forestland and grassland meet or the boundary where wetlands meet prairie. Many things form a sharp boundary such as natural formations. The area where the land meets water such as where the mangrove fields meet the ocean is also considered an ecotone. The estuary between freshwater and saltwater is also a natural ecotone.

An ecotone can be a narrow or wide area of the ecosystem. It is considered a zone of tension.

The word 'ecotone' was derived from the word ecology and the Greek word *tonos*, which means tension. The ecotone often shares many of the animal and plant species that both areas contain but it is also unique because it is the blending of two distinct areas.

Plants and trees tend to live along an ecotone and stretch as far into the other area as possible but because of the transition the plants or trees cannot survive past the ecotone.



Figure: The sphere would remain open to the public for nine years until an accident involving some routine welding maintenance caused the acrylic covering to catch fire, engulfing the entire sphere in a spectacular ball of fire with flames that burned for 30 minutes. When the flames subsided, there was no sign of the acrylic walls to be seen, but the steel trusses of the dome remained. After the fire, the dome was closed to the public for over fifteen years. (Photo credit - *collectionscanada*)

The 'Make In India' program is an initiative launched to encourage companies to increase manufacturing in India. Prime Minister Narendra Modi launched the Make in India initiative on September 25, 2014, with the primary goal of making India a global manufacturing hub. This not only includes attracting overseas companies to set up shop in India, but also encouraging domestic companies to increase production within the country. 'Make in India' aims at increasing the GDP and tax revenues in the country, by producing products that meet high quality standards, and minimising the impact on the environment.



Fostering innovation, protecting intellectual property, and enhancing skill development are the other aims of the program according to the 'Make in India' website.

Policies under 'Make in India' initiative:

There are 4 major policies under the 'Make in India' program:

1. New Initiatives: This initiative is to improve the ease of doing business in India, which includes increasing the speed with which protocols are met with, and increasing transparency.

Here's what the government has already rolled out

- Environment clearances can be sought online.
- All income tax returns can be filed online.
- Validity of industrial licence is extended to three years.
- Paper registers are replaced by electronic registers by businessmen.
- Approval of the head of the department is necessary to undertake an inspection.

Foreign Direct Investment (FDI):

The government has allowed 100% FDI in all the sectors except Space(74%), Defence (49%) and News Media (26%). FDI restrictions in tea plantation has been removed, while the FDI limit in defence sector has been raised from the earlier 26% to 49% currently.

Intellectual Property Facts:

The government has decided to improve and protect the intellectual property rights of innovators and creators by upgrading infrastructure, and using state-of-the-art technology.

The main aim of intellectual property rights (IPR) is to establish a vibrant intellectual property regime in the country, according to the website.

These are the various types of IPR:

- Patent: A patent is granted to a new product in the industry.
- Design: It refers to the shape, configuration, pattern, colour of the article.
- Trade mark: A design, label, heading, sign, word, letter, number, emblem, picture, which is a representation of the goods or service.
- Geographical Indications: According to the website, it is the indication that identifies the region or the country where the goods are manufactured.
- Copyright: A right given to creators of literary, dramatic, musical and artistic works.
- Plant variety Protection: Protection granted for plant varieties, the rights of farmers and plant breeders and to encourage the development of new varieties of plants.
- Semiconductor Integrated Circuits Layout-Design: The aim of the Semiconductor Integrated Circuits Layout-Design Act 2000 is to provide protection of Intellectual Property Right (IPR) in the area of Semiconductor.

National manufacturing:

Here the vision is,

- to increase manufacturing sector growth to 12-14% per annum over the medium term.
- to increase the share of manufacturing in the country's Gross Domestic Product from 16% to 25% by 2022.
- to create 100 million additional jobs by 2022 in manufacturing sector.
- to create appropriate skill sets among rural migrants and the urban poor for inclusive growth.
- to increase the domestic value addition and technological depth in manufacturing.
- to enhance the global competitiveness of the Indian manufacturing sector.
- to ensure sustainability of growth, particularly with regard to environment.

25 major 'Make in India' focus areas:

1. Automobiles
2. Automobile Components
3. Aviation
4. Biotechnology
5. Chemicals

Solution: Option (i) From the graph, we see that the curve flattens at around 100 min (37° C), while this happens at around 140 min for 25°C. This indicates a slowing down (but not a stop) earlier for 37°C. The growth stops (as per the graph) at 160 min for 37°C and 180 min for 25°C. So, even the stop in the growth occurs earlier at the higher temperature; (i) is true.
 (ii) At 37°C, the concentration of 0.8 is attained at round 85 min. At 25°C, it is attained at around 125 min. This is much less than the twice 85 min; ii is false.
 Hence, the correct option is (A)

Q.29 Match the architectural movements in Group-I with their proponents in Group-II.

GROUP I		GROUP II	
P.	Deconstruction	1.	Joseph Paxton
Q.	Historicism	2.	Kenzo Tange
R.	Metabolism	3.	Walter Gropius
S.	Art Nouveau	4.	Victor Horta
		5.	Frank O. Gehry

(A) P-5, Q-1, R-2, S-4 (B) P-5, Q-4, R-2, S-3 (C) P-5, Q-2, R-3, S-3 (D) P-2, Q-4, R-1, S-5

If you knew Victor Horta, the question could have been so easy.

Art Nouveau is a French word meaning "New Art". Belgium was an early center of the art nouveau, thanks largely to the architecture of **Victor Horta**, who designed the first art nouveau houses, the Hôtel Tassel in 1893, and the Hôtel Solvay in 1894.

Answer: (A)

Q.30 The Pritzker Architecture prize for the year 2016 has been awarded to
 (A) Alejandro Aravena (B) Frei Otto (C) Stephen Breyer (D) Yung Ho Chang



Figure: There are two photographs here. Aravena provided a concrete frame, with kitchen, bathroom and a roof (left), which were designed to allow families to fill in the gaps (right). So, the architect provided a basic concrete frame, complete with kitchen, bathroom and a roof, allowing families to fill in the gaps, and stamp their own identity on their homes in the process. Photograph: Cristobal Palma, Source: www.theguardian.com

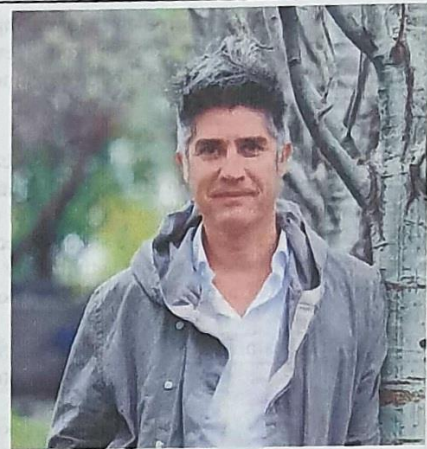


Figure: Pritzker Architecture Prize 2016
Alejandro Aravena

The architect Alejandro Aravena is from Chile. Runs a design firm ELEMENTAL. He is known his pioneering social housing projects in Latin America.

Answer: (A)

Q.31 Match the classical urban planning theories in Group-I with their proponents in Group-II

GROUP I		GROUP II	
P.	Concentric Zone Model	1.	Beny and Horton
Q.	Sector Model	2.	Homer Hoyt
R.	Multiple Nuclei Model	3.	Ernest Burgess
S.	Factorial Ecology	4.	Shevky and Bell
		5.	Harris and Ullman

(A) P-4, Q-1, R-3, S-5 (B) P-3, Q-2, R-3, S-5 (C) P-2, Q-4, R-5, S-1 (D) P-3, Q-2, R-5, S-1

QUESTION BANK

LATEST 5 YEARS [2017 ~ 2021]

Q&A with ESSENTIAL NOTES
For Architecture & Planning

All Pages Printed in
COLOUR

For Better Recall in Exam

&

**EMMERSIVE
READING
EXPERIENCE**



By Faculty of Architecture



GATE ARCHITECTURE .COM

Volume

1

Click to
Buy:



Buy now on Instamojo