

SECTION A

PART I: Multiple Choice Questions [30 marks]

Choose the correct answer and write down the letter of your chosen answer in the Answer Booklet against the question number e.g. 31 (d). Each question carries ONE mark. Any double writing, smudgy answers or writing more than one choice shall not be evaluated.

1. The minimum thickness of a wall where single Flemish bond can be used is
 - a) Half-brick thick
 - b) One-brick thick
 - c) One and half-brick thick
 - d) Two-brick thick

2. A Rock-cut style of architecture is presented by _____ in India.
 - a) Shyama Rama Temple, Bishnupur
 - b) Kandariya Mahadeva Temple, Khajuraho
 - c) Sanchi Stupa, Sanchi
 - d) Kailasa Temple, Ellora

3. A part of the structure which is in direct contact with the ground to which the loads are transmitted is called
 - a) Wall
 - b) Foundation
 - c) Slab
 - d) Column

4. Following are the theories of proportions followed by architects over ages EXCEPT
 - a) Romanian Theories
 - b) Renaissance Theories
 - c) Golden Section
 - d) Classical orders

5. In the 1907, His Majesty Gongsar Ugyen Wangchuck was crowned as the first Monarch of Bhutan marking the establishment of highly revered Wangchuck dynasty. The first court of Wangchuck dynasty was started in
 - a) Kuenga Rabten, Trongsa
 - b) Thruempang Palace, Trongsa
 - c) Wangduechhoeling Palace, Bumthang
 - d) Ugyen Pelri Palace, Paro

6. As per the Development Control Regulation (DCR) 2016 for Thimphu Thromde, _____ is the covered area of all floors excluding the area of the walls.
 - a) Built-up area
 - b) Carpet area
 - c) Covered area
 - d) Plinth area

7. In the year 2001, the World Trade Centre in New York was destroyed by a devastating act of terrorism and it has been concluded that collapse of the structure was due to
- wind load failure.
 - foundation failure.
 - thermal performance failure of reinforcement steel in rcc.
 - thermal performance failure of structural steel.
8. Which of the following relates to the function of shades over opening or roof over hangs for the building?
- To block the direct sunlight.
 - To protect the building from rain.
 - To protect building from dust.
 - To allow winter sun and exclude summer sun.
9. Solar energy is very critical when it comes to sustainable building design and solar energy can be used for lighting a house. Which of the following lamps can be directly connected to solar cell?
- Incandescent lamp
 - Light Emitting Diode lamp
 - Compact Fluorescent Lamp
 - Metal Halide lamp
10. The Neo-classical movement in the 18th century began a reaction against
- Baroque style
 - Renaissance style
 - Gothic style
 - Romanesque style
11. The modular proportion system in design was practiced by which famous architect?
- Le Corbusier
 - Zaha Hadid
 - Frank O' Gehry
 - Renzo Piano
12. The property of concrete measured by the slump test is
- Hardness
 - Strength
 - Workability
 - Durability
13. To maximize the sun energy to a building, the larger face of the building should be faced to
- south and east.
 - north and west.
 - north and south.
 - east and west.

14. Following are the methods for soil testing for the foundation EXCEPT
- Trail pit
 - Non-destructive test
 - Load test
 - Bore holes
15. _____ is the horizontal member of a shutter that subdivides a window.
- Reveal
 - Purlin
 - Mullion
 - Transom
16. Plumbing and sanitary fittings is noted to be an important aspect of building construction. S-trap for WC is designed for outlet through
- Wall
 - Floor
 - Beam
 - All of the above
17. A combination of colours forming an equilateral triangle in colour wheel is called
- Triad scheme
 - Analogue scheme
 - Split complementary scheme
 - Double complimentary scheme
18. *Sha-thong* and *Shari* are the Bhutanese architectural terminology used for
- vertical and horizontal members of the *rabsey*.
 - components of *kachen* and *zhu*.
 - components of roof structure.
 - vertical and horizontal members of door frame.
19. According to Development Control Regulation 2016 for Thimphu Thromde, the FAR for medium density and mixed use is
- 0.5 - 1.5
 - 1.0 - 2.5
 - 1.0 - 1.5
 - 0.5 - 1.0
20. The constructions in rural area in Bhutan has to be carried out as per the Bhutan Building Regulations 2018 and as per this regulation the setback required for 2 floors is
- 3 meters from 3 sides and 5 meters to accommodate septic tank.
 - 2 meters from 3 sides and 5 meters to accommodate septic tank.
 - 1.5 meters from 3 sides and 4 meters to accommodate septic tank.
 - 2 meters from 3 sides and 4 meters to accommodate septic tank.

21. “Villa Savoye” in Paris is an example of
- Modernism
 - Post Modernism
 - Deconstructivism
 - Eclecticism
22. The Italian Renaissance architects based their theories and practices on
- Anthropometry
 - Classical Greek
 - Classical Gothic
 - Classical Roman
23. What will be the number of lamps, each having 400 lumens, required to obtain an average luminance of 100 lux in a 4m × 3m rectangular room?
- 6
 - 3
 - 2
 - 4
24. Which of the following represent the secondary architectural elements by the “Bhutanese Architectural Guidelines”?
- Chim-thok
 - Rabsey
 - Pem-choetse
 - Cham
25. For a two-way RCC slab, the length to width (L/W) ratio should be
- $0.5 \leq L/W \leq 2$
 - $2.0 \leq L/W \leq 3$
 - $2.5 \leq L/W \leq 4$
 - $0.0 \leq L/W \leq 0.5$
26. Match the **land use** in Column I **prime activities** in Column II
- | Column I | Column II |
|----------------------------|-----------------------------------|
| i. Commercial | W. Crematorium and burial grounds |
| ii. Public and semi-public | X. Truck Terminals |
| iii. Recreational | Y. Hotels |
| iv. Transportation | Z. Parks and gardens |
- i - Z, ii - X, iii - W, iv - Y
 - i - Y, ii - W, iii - X, iv - Z
 - i - W, ii - Z, iii - Y, iv - X
 - i - Y, ii - W, iii - Z, iv - X
27. Which of the following is TRUE?
- Frank Lloyd – house is machine for living.
 - Meis Van Der Rohe – form follows functions.
 - Le Corbusier – Organic architecture.
 - Robert Venturi – less is bore.

28. Solar window is an important consideration taken into account while working on sustainable building design and it is framed within certain time during the day from between June 21st and December 22nd. What is the time frame considered for solar window?
- a) 10 am to 2 pm
 - b) 9 am to 3 pm
 - c) 10 am to 3 pm
 - d) 11 am to 4 pm
29. Simply supported, continuous and cantilevered are method used for structural design of
- a) Beam
 - b) Column
 - c) Beam and slab
 - d) Slab
30. The structure shown in the below picture is a work of which famous architect?
- a) Renzo Paino
 - b) Zaha Hadid
 - c) Ricardo Legorretta
 - d) Santiago Calatrava



PART II – Short Answer Questions [20 marks]

This part has 4 Short Answer Questions. Answer ALL the questions. Each question carries 5 marks.

Question 1

Write a short note on the following principles of design. (5 marks)

- a) Axis
- b) Symmetry
- c) Rhythm
- d) Hierarchy
- e) Harmony

Question 2

List down five climatic elements affecting the built environment. (5 marks)

Question 3

- i. Write down two salient features of roman urban planning and describe it briefly. (2.5 marks)
- ii. Match the following typical terminology used for description of traditional farm house:
(2.5 marks)

Column I

- a. Barthok
- b. Taenthok
- c. Gagona
- d. Yotoka
- e. Wothok

Column II

- f. The courtyard
- g. The ground floor
- h. The middle floor
- i. The upper floor
- j. The attic

Question 4

A comprehensive Development Control Regulation has been prescribed for Thimphu Thromde and similarly for other Thromdes also. You as an upcoming practitioner in the field of construction, list down two advantages and two disadvantages of the regulation and discuss each of them briefly.

SECTION B: CASE STUDY [50 marks]

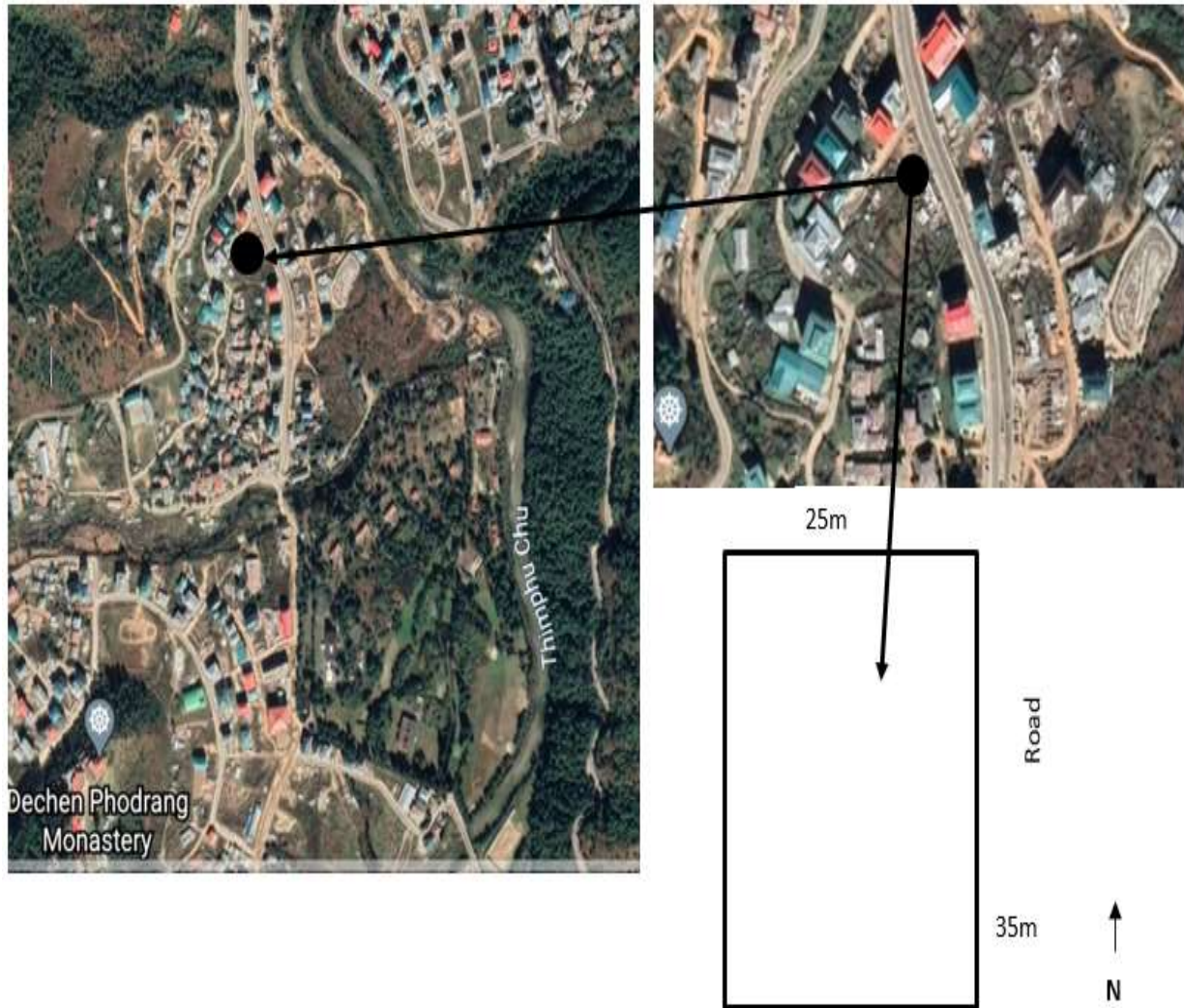
Choose either CASE I or CASE II from this section. Each case study carries 50 marks. Mark for each sub-question is indicated in the brackets.

CASE I

1. Sketch the detail elevation of a *Payab Gochu* and level all the elements. (15 marks)
2. Compare or contrast different types of vernacular architecture in Bhutan. (20 marks)
3. Discuss the importance of sustainability in modern Bhutanese architecture. (15 marks)

CASE II

You have been hired as an architect to carry out the design and drawings for a building to be constructed in the Jungzhina LAP under Thimphu Thromde. The plot falls under UV-2 precinct and measures 35m x 25m as shown below.



Referring the tables below (Table 1 and Table 2), please work on designing a building which best suits the land use and regulations applied for the particular area. Provide the following details as part of your designing process:

- Brief write-up on the concept (100-200 words).
- Sketches to support the concept.
- Basic drawings (site plan clearly showing the site and building dimensions, floor plans, section (min. 2) and elevations (min. 4))
- Descriptions of any other features.

Following tables show the Development Control Regulation for Zhungzhina LAP:

Table 1:

	Designated	Plot area	Max. plot Coverage	Setbacks Front, Side, & Rear	Max. Height
		(SQ.M.)	(%)	Meter	No. Of Floors
1	UV-1 Urban Village Core	1,000-2,500 2,501-5,000 >5,000	50 45 40	2m in the Front, 3&5m in the Side, 3 or 5m at the Rear	6 6 6
2	UV-2 (MD) Urban Village Periphery	371.6-1,000 1,001 - 2,500 > 2,500	40 45 50	3m on three sides and 5m on the side accommodating the septic tank	5 5 5
3	UV-2 Sub Category - I Urban Village Periphery Sub - I	371.6-1,000 1,001 - 2,500 > 2,500	40 45 50	3m on three sides and 5m on the side accommodating the septic tank	4 4 4
4	UH Urban Hub	>371.6	60	3m on three sides and 5m on the side accommodating the septic tank	3+ mezzanine or 4 without mezzanine
5	WS Workshop Precinct	>371.6	60	3m on three sides and 5m on the side accommodating the septic tank	3+ mezzanine
6	I Institutional	>1,000	30	3m on three sides and 5m on the side accommodating the septic tank	6
7	H Heritage Precincts	As per the guideline of Heritage Precinct			

Table 2:

Sl. no	Designated urban precinct	Uses permissible	Special conditions and restrictions
2	<p>UV – 2 (MD) Urban Village Periphery</p> <p>UV2- SUBCATEGORY I URBAN VILLAGE PERIPHERY SUB-I UV2- SUBGATORY II URBAN VILLAGE PHERIPHERY SUB-II</p>	<p>Medium Density Mixed Use Precinct</p> <p>Apartments and group housing are permitted. Residential, local level retail shops and services, household economic activity and cottage industries not involving use of, or installation of, total machinery driven by more than 10KW power and which do not create noise, vibrations, fumes, dust, etc. only in independent dwelling units (not in tenement dwellings or flats). Commercial uses like local level retail shops with or internet browsing centre, fast food outlets, canteens, snack bars will be permitted only on the ground floor or maximum of two floors interconnected with the ground floor. Educational institutional buildings, daycare centers, dispensaries, clinics, public facilities and utilities, local community halls and service apartments and TCB standard hotels with boarding and lodging are allowed. Bars, discotheque, pool rooms and any other night time recreational centers and activities contradicting with residential uses would not be permitted. 2% extra coverage may be permitted if lift is provided for G+4 building.</p>	<p>Resorts in a minimum of 2,500sqm plot may be permitted. Sports complexes and public utility facilities in a minimum plot area of 4,000sqm.</p> <p>Cinema Halls may be permitted in a minimum plot size of 1000sqm Side and rear setback spaces, below natural ground level or abutting high natural slope, where there is no adjacent neighbors, spaces may be developed for public amenities or storage facilities only. This shall not come into the calculation of coverage.</p> <p>Entry porch may be allowed but it should not compromise the adequacy of parking and it will not be included in the coverage.</p> <p>Basement construction will be permitted subject to following conditions:</p> <ol style="list-style-type: none"> 1. Parking fulfillment subject to design check and site visit. Dead space may be used for low income housing or storage subject to lighting, ventilation and safety fulfillment as per BBR. 2. To bring the habitable space to natural ground or road level, for this case it may be used for low income housing or storage subject to lighting, ventilation and safety fulfillment as per BBR. <p>Parking slab may be allowed subject to site condition and site visit. No structures shall be erected on parking slab.</p> <p>Parking slab may extend from the building to the plot boundary to facilitate parking only.</p> <p>Spaces beneath the parking slab may be used for storage, commercial and habitable space provided it fulfills the BBR requirements.</p>

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