ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2021
EXAMINATION CATEGORY: TECHNICAL

PAPER III: SUBJECT SPECIALISATION PAPER FOR ARCHITECTURE

Date : October 31, 2021
Total Marks : 100
Writing Time : 150 minutes (2.5 hours)
Reading Time : 15 minutes (prior to writing time)

GENERAL INSTRUCTIONS:

1. Write your Registration Number clearly and correctly on the Answer Booklet.
2. The first 15 minutes is to check the number of pages of Question Paper, printing errors, clarify doubts and to read the instructions. You are NOT permitted to write during this time.
3. This paper consists of **TWO SECTIONS**, namely SECTION A & SECTION B:
   - **SECTION A** has two parts: Part I - 30 Multiple Choice Questions
     Part II - 4 Short Answer Questions

     All questions under SECTION A are COMPULSORY.
   - **SECTION B** consists of two Case Studies. Choose only **ONE** case study and answer the questions of your choice.
4. All answers should be written on the Answer Booklet provided to you. Candidates are not allowed to write anything on the question paper. If required, ask for additional Answer Booklet.
5. All answers should be written with correct numbering of Section, Part and Question Number in the Answer Booklet provided to you. Note that any answer written without indicating the Section, Part and Question Number will NOT be evaluated and no marks will be awarded.
6. Begin each Section and Part in a fresh page of the Answer Booklet.
7. You are not permitted to tear off any sheet(s) of the Answer Booklet as well as the Question Paper.
8. Use of any other paper including paper for rough work is not permitted.
9. **You must to hand over the Answer Booklet to the Invigilator before leaving the examination hall.**
10. This paper has **7 printed pages**, including this instruction page.

GOOD LUCK

SECTION A

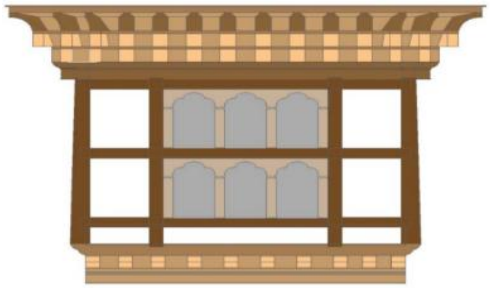
PART I: Multiple Choice Questions [30 marks]

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. Which of the following traditional arts and crafts (Zorig chusum) of Bhutan is not related to architecture and building construction?
   a) Shingzo
   b) Dozo
   c) Paapzo
   d) Thagzo

2. The architectural term for post and lintel construction is
   a) Barrel vault
   b) Nubian vault
   c) Trabeation
   d) Cupola

3. The adjacent figure is an example of
   a) Lobur Rabsel
   b) Gomang Rabsel
   c) Nyimchu Rabsel
   d) Byelgo Rabsel



4. 1 acre = _____
   a) 43560 square feet
   b) 4046 square meters
   c) 100 decimals
   d) All of the above

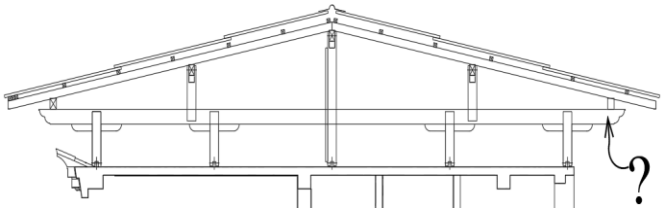
5. Which one of the following is TRUE?
   a) Window openings facing north in the northern hemisphere receive more sunlight.
   b) Window openings facing south in the northern hemisphere receive more sunlight.
   c) The sun angle is low in summer in the northern hemisphere.
   d) The sun angle is high in winter in the northern hemisphere.

6. Ancient Romans transported water from a great distance. What Roman engineering aspect could have achieved this?
   a) Cobble stone roads
   b) Aqueduct
   c) Amphi-theater
   d) Colosseum

7. "Usonian Houses" is associated with which one of the following Architects?
   a) Frank Owen Gehry
   b) Hassan Fathy
   c) Frank Lloyd Wright
   d) Le Corbusier

8. A public open space used for assemblies and markets in ancient Greek is known as
   a) Skene
   b) Agora
   c) Logeion
   d) Proscenium

9. In the sketch below, the timber element in question is known as
   a) Dhingri Langna
   b) Shatung
   c) Shari
   d) Tsim



10. "Order" or "Order of architecture" in Classical and Neo-classical style refers to which one of the following architectural elements?
    a) Proportion of façade
    b) Roof Column and entablature
    c) Window
    d) Column and entablature

11. Which of the following architect designed New Delhi?
    a) Christopher Wren
    b) Edwin Lutyens
    c) Laurie Baker
    d) Charles Correa

12. Shamig (Ekra) is a traditional Bhutanese construction technique which is similar to
    a) Fresco
    b) Dado
    c) Wattle and daub
    d) Veneered wall

13. Ponding, a method to cure concrete works, is typically used to cure
    a) Beam
    b) Column
    c) Slab
    d) Foundation

14. "Optical illusion in architecture" is best represented by
    a) Parthenon
    b) Pantheon
    c) St. Peter's Basilica
    d) Leaning tower of Pisa

15. The ratio **1:1.618** used by artists and architects is also known as
    a) Golden Section
    b) Fibonacci series
    c) Golden ratio
    d) All of the above

16. All of the following are wall construction techniques using mud/dirt, EXCEPT
    a) Rammed earth
    b) Cob
    c) Stud
    d) Adobe

17. Which one of the following is an eco-friendly and sustainable building construction material?
    a) Concrete
    b) Steel
    c) Autoclaved aerated concrete
    d) None of the above

18. Which of the following is NOT TRUE?
    a) Antoni Gaudí – Sagrada Família
    b) Norman Foster – Bird's Nest Stadium
    c) Fariborz Sahba – Lotus Temple
    d) Jørn Utzon – Sydney Opera House

19. Which of the following material has high thermal mass?
    a) Water
    b) Air
    c) Concrete
    d) Clay bricks

20. The picture below is an elevation of a stone masonry wall. What type of masonry is reflected below?
    a) Coursed ashlar
    b) Random Rubble
    c) Coursed rubble
    d) Random Ashlar

21. The ratio of Reinforced Cement Concrete 1:2:4 means
    a) 1 aggregate, 2 sand and 4 cement
    b) 1 sand, 2 cement and 4 aggregates
    c) 1 cement, 2 sand, 4 aggregates
    d) 1 cement, 2 aggregates and 4 sand

22. Timber as a construction material is good in
    a) Tensile strength
    b) Compressive strength
    c) Both in tensile and compressive strength
    d) All of the above.

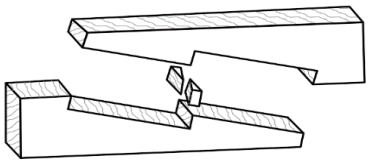
23. Which of the following window glazing system has the highest thermal performance?
    a) Single glazed clear glass window
    b) Single glazed toughened glass window
    c) Triple glazed clear glass window
    d) Double glazed toughened glass window

24. A timber floor board measures **1 ft x 12 ft x 1 inch**. What is its volume in cubic feet?
    a) 12
    b) 1
    c) 10
    d) None of the above.

25. Topographical survey of a plot is required for an architect
    a) to assess the plot height from the mean sea level.
    b) to study the solar path.
    c) to assess the height of the proposed building.
    d) None of the above.

26. LED (LED bulb) stands for
    a) Light Efficient Design
    b) Light Emitting Diode
    c) Low Electric Design
    d) Long Energy Diode

27. What is the name of Timber Joinery shown in the figure below?
    a) Dovetailed joint
    b) House Joint
    c) Scarf Joint
    d) Mortise and Tenon joint



28. A horizontal structural member over a door or a window opening is called
    a) Beam
    b) Lintel
    c) Sill
    d) Jamb

29. A red band around the external walls of a building that marks the structure as a sacred religious place is called
    a) Norbu bagam
    b) Keymar
    c) Gyetsa
    d) Gyeltshen

30. Louvre Museum (adjacent picture – pyramid shaped) in Paris, France is designed by which of the following architect?
    a) Norman Foster
    b) I.M.Pie
    c) Daniel Libeskind
    d) James Stirling

PART II – Short Answer Questions [20 marks]

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

1) Sketch and label different components of *kachen* (traditional Bhutanese timber column).

2) If you are to design a passive solar efficient building in Phuntsholing Bhutan, which aspects of the design would you work on to produce the desired result. Provide illustrations where necessary.

3) In building tradition there are many influences which impact the form and spatial function of a building, viz. climate, environment, socio-economic aspects, culture and tradition, geography etc. Which factor or factors do you think impact most in building traditions?

4) Design/sketch (only plan) a residential building toilet measuring 4.50 square meter (maximum) in plan and clearly label the following fixtures – water closet, wash basin, shower, towel rail, toilet paper holder, floor traps etc. A proper dimension should be assigned in plan including the wall-to-wall dimensions and the relative dimensions of toilet fixtures from the internal wall.

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

Bhutan is located in seismically active regions in the Himalayas. The unfortunate event of the earthquake of 21 September, 2009, claimed 12 lives and damaged more than 5,000 traditional structures. The 6.1 magnitude (M) earthquake, with its epicentre in the remote village of Narang in Eastern Bhutan, affected mostly the non-engineered - artisan or owner built - traditional stone masonry structures. These buildings in the rural areas were mostly built within the framework of traditional building typologies and construction techniques.

a) List the salient features of traditional two storey stone masonry house highlighting architectural features and methods of construction that may or may not be resistant to earthquake. Provide as much illustrations and sketches to support your answers. (30 marks)

b) Suggest alternative design and/or construction techniques to improve its (traditional stone masonry house) resistance to earthquakes using **traditional/sustainable construction materials**. Provide as much illustrations and sketches to support your answers. (20 marks)

CASE II

Question 1

Which architect or architects influenced you most during your undergraduate studies and why? Support your answers with his/her famous works that inspired you in developing your thought process and ideologies. Provide illustrations/sketches to support your answers. (15 marks)

Question 2

Provide a brief description of your Thesis Project and it should include the following; (15 marks)

a) Project title and site location (Why did you chose these?)
b) Site analysis
c) Design concepts
d) Sketches (plans, elevations, sections, perspectives)

Question 3

As an architect you have been hired by a client in need of your services for a building design. The client also requested you to support in fulfilling other requirement such as engineering design, drawings, bills of quantities etc. so that it is easy for the client to get approval from the concerned Municipality/Authority. The client wants to outsource the construction to a builder and expects you to oversee the quality of construction. Basically, the client wants to rely on you from the design inception to the completion of the building.

What role will you play as the **lead architect** of this project in fulfilling the needs of the client? List and explain all the activities, co-ordination, procedures, process, expertise, contractual agreement etc. required to successfully complete the construction. (20 marks)