

SECTION A [50 MARKS]
ANSWER ALL QUESTIONS

Question 1

- a) **Direction: For multiple choice questions, there are four alternatives: A, B, C, and D. Choose the correct alternative and circle it. Do not circle more than ONE alternative. If there is more than one choice circled, No score will be awarded.** [15]
- i. The theory that was developed based on the principles of Newton's Law of Gravitation and Rotatory Motion was propounded by
- A Pierre Laplace.
 - B Emmanuel Kant.
 - C Georges Lemaitre.
 - D James Clerk Maxwell.
- ii. The sensor that gathers radiation emitted or reflected by an object or the surrounding space through reflected sunlight is
- A light sensors.
 - B active sensors.
 - C passive sensors.
 - D ultrasonic sensors.
- iii. Plumbing fork is a U-shaped metal frame with a lower inclined arm and a upper horizontal arm. The vertical line passes through the pointed edge of the upper arm when the plumbing fork is kept on a plane table. Which function of the instrument describes the above statement?
- A Alidade is used for drawing the line of sight.
 - B Plumb bob transfers the ground point to the drawing sheet.
 - C Drawing board is fixed on the tripod to conduct a plane table survey.
 - D Trough compass is a magnetic compass used to accurately align instruments.
- iv. Podzolic soils are not opted for practising agriculture because
- A it is acidic in nature.
 - B it is alkaline in nature.
 - C calcium content is less.
 - D it has low bacterial activity.
- v. A piece of land is covered with straw or any other organic matter. This helps the soil to retain moisture. Which soil conservation technique is adopted in the statement?
- A mulching
 - B buffer strips
 - C wind breaks
 - D contour barriers

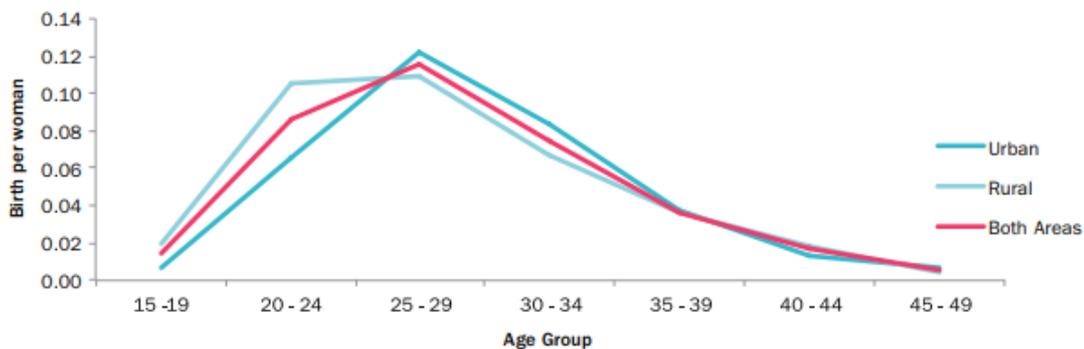
- vi. Rocks are composed of minerals, but minerals are not composed of rocks. Identify the best examples of rocks.
- I. Marble
 - II. Sandstone
 - III. Feldspar
 - IV. Slate
- A I, II and III
 - B I, II and IV
 - C I, III and IV
 - D II, III and IV
- vii. Bhutan has tapped only one fourth of water energy despite its capacity of producing 30,000 MW. What is the first goal towards tapping all water energy in Bhutan?
- A Starting projects at a time with a feasible study
 - B Starting projects phase wise with a feasible study
 - C Starting projects at a time without a feasible study
 - D Starting projects phase wise without a feasible study
- viii. A long, deep and narrow body of water that reaches far inland is called a
- A tarn.
 - B horn.
 - C fjord.
 - D corrie.
- ix. The rise of the urban population has given Bhutan one of the biggest socio-economic problems of the day. Few years ago, acres of green paddy fields in Thimphu valley had to be brought under urban development. The kind of housing scheme we came up with to accommodate the rising population in the capital was met with myriad challenges. To name but a few, there wasn't enough water for the city population, and there wasn't enough space for the growing number of vehicles in the city.

(Source: Kuensel January 2019)

The following are the most appropriate ways to address the above issue **EXCEPT**

- A smart urban planning.
 - B encourage urban sprawl.
 - C development of rural areas.
 - D implementation of city green belt zone.
- x. Which of the following is **NOT** a favourable condition for dew formation?
- A calm air
 - B clear sky
 - C long night
 - D low relative humidity

- xi. The heavy investment in hydropower projects in Bhutan will not guarantee sustainable growth of the economy because
- A about 80% of surplus power is exported to India.
 - B there are other sources of energy which are cheaper.
 - C it is eco-friendly and does not harm the environment.
 - D hydropower is renewable so it will never get exhausted.
- xii. Augmented Reality and Virtual Reality are the latest tech innovations in this industry. AR adds digital influences to real life, whereas VR allows the users to step into a magical world. Console, PC and clouds are other modern tech providing one of the most immersive and awe-inspiring forms of entertainment to more than two billion people around the globe. The creative industry that best fits the given description is
- A film.
 - B music.
 - C gaming.
 - D photography.
- xiii. Glacial Lake Outburst Flood is a serious concern for Bhutan. This is mainly due to
- A climate change.
 - B weather fluctuation.
 - C increase in the population.
 - D increase in livestock farming.
- xiv. The illustration depicts the Age Specific Fertility Rate by Area in Bhutan as per PHCB 2017.



Which one of the following statements is the correct interpretation of the graph?

- A The highest ASFR is observed in the age group 25-29 and the lowest in the age group 45-49 years.
- B The highest ASFR is observed in the age group 25-29 and the lowest in the age group 15-19 years.
- C The highest ASFR is observed in the age group 30-34 and the lowest in the age group 45-49 years.
- D The highest ASFR is observed in the age group 30-34 and the lowest in the age group 15-19 years.

xv. Which one of the following devices acts as a user segment in interpreting the messages received from satellites?



(I)



(II)



(III)



(IV)

- A I
- B II
- C III
- D IV

b) Write TRUE or FALSE for the following statements in the space provided. [5]

i. The survey conducted to demarcate agricultural land, settlements and forest cover is called cadastral surveying.		
ii. Sustainability of hydropower projects in Bhutan is not dependent on the life span of the snow, ice and glaciers.		
iii. Monitor Stations track GPS satellites as they pass overhead, collect signals and feed information to the master control station.		
iv. Higher population density in urban centres leads to the production of a large quantity of organic and inorganic solid waste. Therefore, rural areas face less waste disposal issues compared to urban centres.		
v. During the reference period, persons who worked as paid employees, employers, own account workers, or contributing family workers are said to be the employment seeking population.		

c) Fill in the blanks with appropriate word/s. [5]

- i. The centrifugal force was larger than the centripetal force that developed irregular rings. The Earth is one of the rings thrown away from the centre of the
- ii. The process of transforming igneous and sedimentary rocks into metamorphic rock is called
- iii. If the work of a river is erosion due to its high velocity, the decrease in velocity will lead to

iv. Inorganic materials containing sand deposits in sedimentary rocks is called

.....

v. The process of nuclear fission involves the splitting of the atom of

.....

d) Match each item under Column A with the most appropriate item in Column B. [5]
Write the correct alphabet in the space provided under the 'Answer' column.

Answer	Column A	Column B
	i. Continental glaciers differ from alpine glaciers	a) access funding and resources
	ii. Creative industries are gaining popularity in recent years	b) flow and size
	iii. Strategic issues and challenges in the development of the creative industry	c) disruptions and unprecedented results
	iv. Artificial Intelligence can improve the well-being of both people and the natural world, however if misused	d) creates landforms
	v. Biological weapons differ fundamentally from chemical weapons of mass destruction	e) optimize the economy
		f) massive burning
		g) slower acting

e) Answer the following questions briefly.

i. Surveying is categorised primarily into geodetic surveying and plane surveying. If you happen to work in the National Land Commission Secretariat of Bhutan, which method of surveying would you prefer? Support your stance with **TWO** valid points. [2]

- ii. When we talk about climates, there are two major types. One is Tropical and the other is Temperate. Given an option to settle in one of the climatic zones, which zone would you prefer? Give **TWO** reasons. [2]

- iii. Dzongkhag Health Sectors plans to achieve Zero Infant Mortality Rate annually, however they are unable to accomplish the target. What are the measures to solve this issue in the country? Justify with **TWO** points. [2]

- iv. *“Many countries are affected by cybercrimes and Bhutan is not an exception.”* Suggest **TWO** measures to mitigate cyber bullying in schools. [2]

- v. Study the data in the table and answer the question. [1]

Measures of Fertility	Year	
	PHCB 2005	PHCB 2017
Total Fertility Rate (TFR)	2.6	1.7

What could be the possible reasons that have caused a decrease in **TFR** in the country? State **TWO**.

- vi. The rate of urbanisation has increased in the past ten years in Bhutan. Justify with **ONE** reason. [1]

- f) **Map work** [10]
In the outline map of Bhutan:

- i. Mark with a dot (•) and write ‘NLCS’ over the governmental organisation in Bhutan that produces topographic, thematic, cadastral and large-scale maps for various projects.
- ii. Shade and write ‘ALS’ over one of the Western Dzongkhags where alluvial soil is found.
- iii. Shade and write ‘GLOF’ over the river basin where the risk of Glacial Lake Outburst Flood is maximum.
- iv. Shade and write ‘DMG’ over the Dzongkhag where maximum glaciers are located.
- v. Mark with a dot (•) and write ‘LYUR’ over the Dzongkhag with the Lowest Youth Unemployment Rate as per 2017 PHCB.
- vi. Shade and write ‘RMR’ over the region with the Maximum Rainfall received annually.
- vii. Locate with a dot (•) and write ‘NOA’ over the place where the Bhutanese Film nominated for the Oscar Award in 2022 was shot.

- viii. Mark with a dot (•) and write ‘CZC’ over the place in eastern Bhutan, where the college of Zorig Chusum is located.
- ix. Mark with a dot (•) and write ‘GPTS’ over the Thromde where GIS study was first used for improving public transport service.
- x. Mark with a dot (•) and write ‘DIS’ over the Dzongkhag in the east where a landslide killed people in 2022.

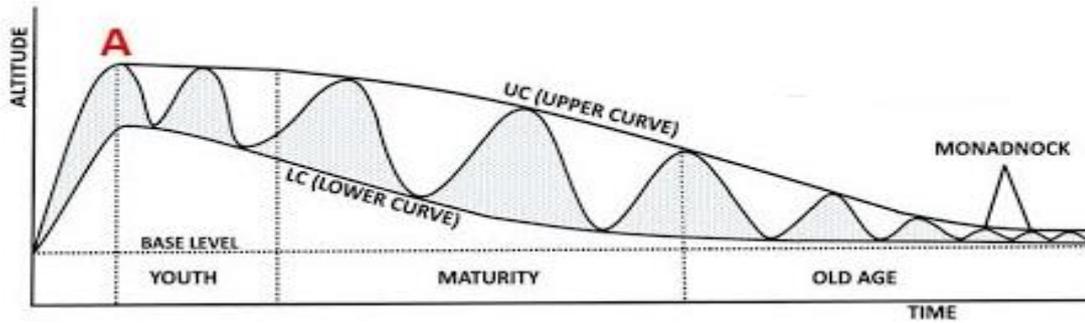
SECTION B [50 MARKS]
ATTEMPT ANY FIVE QUESTIONS

Question 2

- a) What is rock? **[1]**

- b) Gaseous mass hypothesis was not widely accepted by the scientific world. Suggest **THREE** ways to make the theory more reliable. **[3]**

- c) Study the figure and explain how this cycle of erosion is different from Penck's erosion cycle. Discuss **THREE** points. [3]



- d) Tshering D. Wangyel said that most parents in Bhutan discourage their children from online gaming when it is gaining popularity worldwide. Is this a wise decision on the parents' part? Give **THREE** justifications. [3]

Question 3

a) Describe extrusive igneous rock.

[1]

b) *“Third pole is at greater risk of losing snow, ice and glacier cover that would lead to negative impacts towards socio-economic development in Asia.”* As the ICIMOD Director General, write **THREE** measures to protect the Third Pole.

[3]

c) Several challenges hinder creative industries despite being pertinent for the country. Examine any **THREE** challenges.

[3]

- d) Cybercrime is a technological crime, where criminals commit fraud, trafficking in child pornography, intellectual property, stealing identities and violating privacy. State **THREE** strategies to reduce cybercrime. [3]

Question 4

- a) What are the procedures to conduct a plane table survey? [2]

- b) Study the figure and examine any **TWO** differences in Geographic Information System data. [2]



- c) If the relative humidity of Gelephu is 50% and the capacity of the air is 10 grams per kilogram at 15°C, what will be the actual vapour pressure present in the atmosphere at the same temperature? [3]

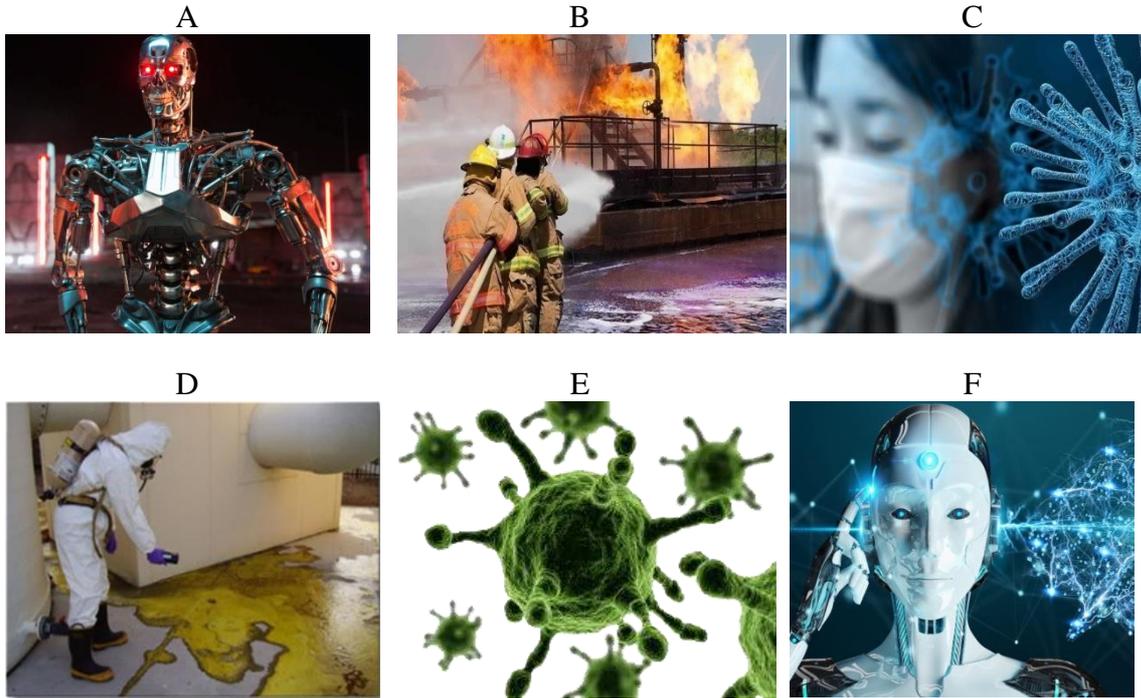
- d) Bhutan is poised to face serious social problems in the future due to the ageing population and shrinking workforce. Why must Bhutan prepare for the ageing population? Explain with **THREE** reasons. [3]

Question 5

- a) What do you understand by a rock cycle? Represent with a diagram, the conditions involved when rock changes from igneous rock to metamorphic rock. [2]

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b) Study the figures and complete the table with the correct letters of emerging hazards. [3]



Industrial Hazard	Artificial Intelligence Hazard	Bioterrorism Hazard	

c) Do you think Global Positioning System plays an important role in Bhutan? Justify with **THREE** reasons. [3]

- d) Despite receiving heavy rainfall during the summer, places like Gelephu, Samtse and Samdrup Jongkhar are confronted with acute shortage of drinking water. Develop **TWO** ways to address the problem. [2]

Question 6

- a) The common technique adopted in soil conservation is mulching. Explain any **TWO** conservation techniques to protect soil. [2]

- b) Is Central Place Theory the best model in the world? Why? Give **THREE** reasons. [3]

- d) *“Over 15,904 Bhutanese were living abroad in 88 countries as of December 22, 2021, according to the State of the Nation report; 5,417 of them live in Australia.”* [2]

Source: Kuensel, January 10, 2022

If this migration trend continues, what negative impacts do you foresee in our country? Explain **TWO** points.

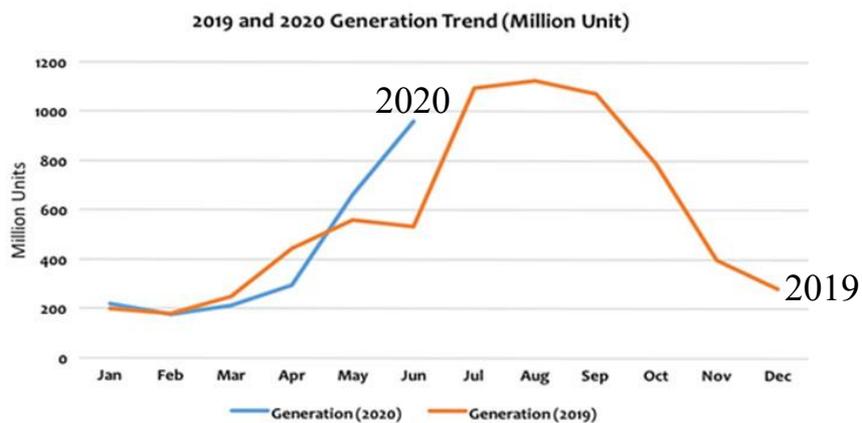
Question 7

- a) *“With each passing year, cartography iterates and expands, entering modern times in the form of advanced geospatial technologies.”* Examine **TWO** differences of Modern Cartography from Traditional Cartography. [2]

Modern Cartography	Traditional Cartography	

- b) Slums and squatter settlements are an eyesore in urban areas. Do you agree? Justify with **TWO** reasons. [2]

c) Study the given graph and interpret the hydropower generation trend for 2019. [2]



2019 hydropower generation trend	Interpretation
July to September	
October to December	

d) “The development of Total Stations has increased efficiency and accuracy in surveying.” Support the statement by providing **TWO** valid reasons. [2]

e) “35.5% of the World’s human population lives in the desert regions.” How do people practice agriculture in such regions? Provide **TWO** reasons.

[2]

Map of Bhutan

This map is to be used for Question 1 (f).

