| TEST CODE: | 7 | 4 | 1 | 2 | 0 | 8 | 8 | FIAS – GS Foundation 2024 \| Benchmark Assignment | #88 |
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# GS FOUNDATION PROGRAM 2024

***to be filled by the student:***

**BATCH: D9**

NAME: _____

ForumIAS Roll No: 19100 _____ Date: _ _ / _ _ / _ _ _ _ _ _ _ _

Email Id: _____ Mobile No. _ _ _ _ _ _ _ _ _ _

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**Feedbacks:**

| | Excellent | Very Good | Good | Average | Immediate Efforts/Improvement Required |
|---|---|---|---|---|---|
| Content | | | | | |
| Presentation | | | | | |
| Structure | | | | | |
| Consistency | | | | | |
| Revision/Recall | | | | | |

**Marks:**

| Subjective | Objective | Total |
|---|---|---|
| | | |

## Subjective Questions:

**Q.1) Discuss the factors influencing soil formation in Indian conditions. Also throw light on distribution of major soil types. (15 marks, 250 words)**

**Subjective Questions:**

**Q.2) Give an account of the differences between the Himalayan and Peninsular drainage systems. (10 marks, 150 words)**

## Objective Questions:

**Q.1)** With reference to effect of soil on local temperature, consider the following statements:

1. Light soils reflect more heat than darker ones.
2. Dry soils like sands are more sensitive to temperature changes than wet soils.

Which of the statements given above is/are correct?

- a) 1 only
- b) 2 only
- c) Both 1 and 2
- d) Neither 1 nor 2

**Q.2)** Which of the following is **incorrect** with reference to Peaty soil?

- a) These soils are found in the areas of heavy rainfall and high humidity.
- b) Peaty soils are rich in humus and organic content.
- c) The phosphate content of these soils is as high.
- d) These soils are not common in floodplains due to the periodic scouring that occurs during flood events.

**Q.3)** Consider the following statements with respect to the Black soil:

1. It is highly retentive of moisture.
2. They are rich in phosphorous, nitrogen and organic matter.
3. Black soils of uplands are of low fertility, but they are fertile in the valleys.
4. Cotton, millets and sugarcane are some of the important crops grown in this soil.

Which of the statements given above are correct?

- a) 1, 3 and 4 only
- b) 1, 2 and 3 only
- c) 1 and 3 only
- d) 4 only

**Q.4)** Which of the following hills/range depict the radial form of drainage pattern?

- a) Nilgiri Hills
- b) Kumaon Hills
- c) Sahyadari Hills
- d) Amarkantak range

**Q.5)** Consider the following statements:

1. In an antecedent drainage pattern, the river cuts through uplifted portions of land.
2. In a superimposed drainage pattern, the river flows in relation to the topology of the area.
3. In a concordant drainage pattern, the river cuts through the exposed rock strata and maintains its initial path.

Which of the statements given above is/are correct?

- ☐ a) 1 only
- ☐ b) 1 and 2 only
- ☐ c) 2 and 3 only
- ☐ d) 1, 2 and 3

# GS Foundation Program 2024 | D9 | Benchmark Assignment #88

## Subjective Questions:

**Q.1) Discuss the factors influencing soil formation in Indian conditions. Also throw light on distribution of major soil types.**

**Soil** is the **mixture of rock debris and organic materials** which develop on the earth's surface. It provides the medium for plant growth, habitat for many insects and other organisms, acts as a filtration system for surface water, carbon store and maintenance of atmospheric gases. It also supports buildings and highways and contributes to the economies of our cities.

**FACTORS**

A. **Parent material**

Base rocks from which soils are formed. This parent material may be deposited by streams or derived from in-situ weathering. Generally, the parent material determines the colouration, mineral composition and texture of the soil.

**Examples:**

1. The ancient crystalline and metamorphic rocks which are basically granite, gneiss and schist form red soils on weathering because they contain iron oxide.
2. **Weathering of basalt rock (formed due to the lava eruption) in Deccan trap** gave rise to black soil.
3. **Cuddapah and Vindhyan** are ancient sedimentary rocks and on weathering they give rise to calcareous and clayey soils. Such soils are generally devoid if metalliferous minerals
4. Tertiary rocks of Himalaya produce alluvial soils on weathering and erosion. This soil has high porosity and fertility. It consists of silt & clay and has little relation with original rock.

**B. Relief**

1. Relief is the most important factor for soil formation in places with steep slopes like the hilly regions, edges of plateaus etc.
2. Soil erosion on barren slopes is rampant and it hinders soil formation. Example: **Chambal ravines**, higher reaches of Himalayas where there is minimal or no forest cover (most on the steep southern slopes) etc.
3. The areas of low relief or gentle slope generally experience deposition and have deep soils. **Example**: Indo-Gangetic plain.
4. The exceptions in the plateau are river basins where the soil layers are sufficiently deep.

**C. Climate**

1. **Temperature and rainfall** determine the effectiveness of weathering of the parent material, quantity of water seeping through the soil and the type of micro-organism present therein.
2. In areas that experience **a lot of rainfall**, water percolating down through soil tends to leach nutrients and organic matter out of the upper layers, unless modified by other soil components like plant roots.
3. For example, the **soils underlying tropical rain forests and evergreen forests tend to be nutrient poor because of intensive leaching due to heavy rains;** most of the nutrients are stored in the lush vegetation itself. In **arid regions like Rajasthan** with little annual precipitation, **high rates of evaporation** encourage the accumulation of salt in the soil.
4. Temperature controls the form of water falling onto the soil surface as well as in the soil. Also, it increases the rate of reactions, such as chemical reactions, evapotranspiration and biological processes. Wide fluctuations in temperature, especially in the presence of water cause shrinking and swelling, frost action and general weathering in soils.
5. Laterite soils are found in alternate wet and dry climates.
6. In Rajasthan, both granite and sandstone give birth to sandy soil irrespective of parent rock because of high temperature and wind erosion.

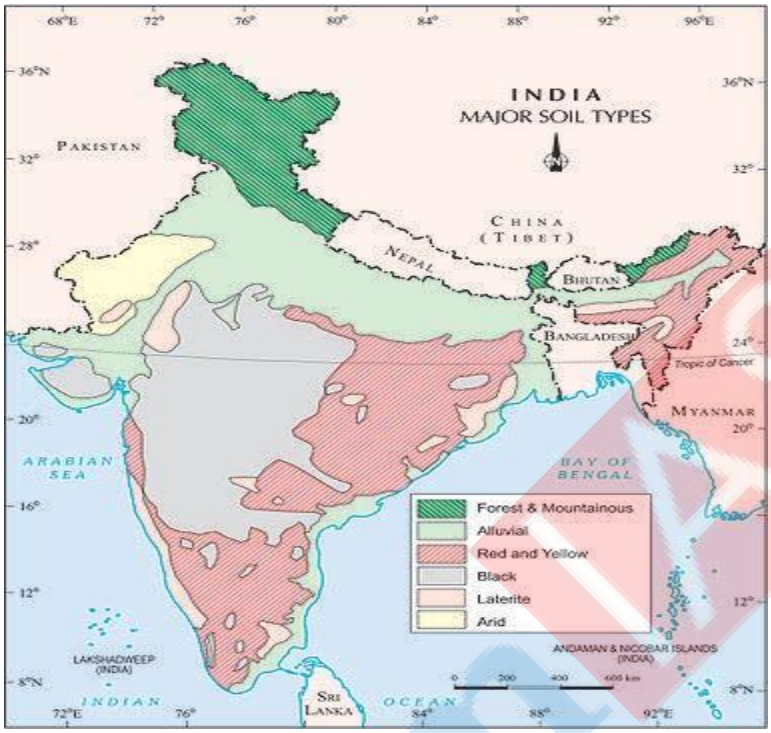
**D. Vegetation and other life-forms**

1. Flora, fauna and microorganisms in conjunction with climate, modifies parent material to produce soil.
2. The kind and number of plants and animals that exist bring organic matter into the soil system as well as nutrient elements. This has a great effect on the kind of soil that will form. For instance, **soils formed under trees are greatly different from soils formed under grass even though other soil-forming factors are similar**.
3. **The roots of plants also hold the soils and protect them from wind and water erosion. They shelter the soils from the sun and other environmental conditions,** helping the soils to retain the needed moisture for chemical and biological reactions.
4. Activities of human and other animals also influence the formation of soil at large extent.

**E. Time**

1. Soil can take many years to form. Younger soils have some characteristics from their parent material, but as they age, the addition of organic matter, exposure to moisture and other environmental factors may change its features.
2. With time, soils settle and are buried deeper below the surface, taking time to transform. Eventually, they may change from one soil type to another.

## DISTRIBUTION OF MAJOR SOIL TYPES IN INDIA




1. **Alluvial Soil-** They are the **largest soil group** covering about **15 lakh sq km** or **about 46% of the total area.** They occur all along the **Indo-Gangetic-Brahmaputra plains** except in a few places where the top layer is covered by desert sand. They also occur in **deltas of the Mahanadi, the Godavari, the Krishna and the Cauvery**, where they are called deltaic alluvium (coastal alluvium). Some alluvial soils are found in the Narmada, Tapi valleys and Northern parts of Gujarat.
2. **Black Soil-** Spread over **46 lakh sq km (16.6% of the total area) across Maharashtra, Madhya Pradesh, parts of Karnataka, Telangana, Andhra Pradesh, Gujarat and Tamil Nadu.** These are the region of high temperature and low rainfall, so it is a soil group typical to the dry and hot regions of the Peninsula.
3. **Red Soil-** These soils mostly occur in the regions of low rainfall. They occupy about **3.5 lakh sq km (10.6%) of the total area** of the country. These soils are spread on almost the whole of **Tamil Nadu.** Other regions with red soil include parts of **Karnataka, south-east of Maharashtra, Telangana, Andhra Pradesh, Madhya Pradesh, Chhattisgarh, Odisha, Chota Nagpur plateau; parts of south Bihar, West Bengal, Uttar Pradesh; Aravallis and the eastern half of Rajasthan (Mewar or Marwar Plateau), parts of North-Eastern states.**
4. **Laterite Soil-** Laterite soils cover an area of **2.48 lakh sq km.** Continuous stretches of laterite soil is found on the **summits of Western Ghats at 1000 to 1500 m above mean sea level, Eastern Ghats, the Rajmahal Hills, Vindhyan, Satpuras and Malwa Plateau.** They also occur at lower levels and in valleys in several other parts of the country. They are well developed in south Maharashtra, parts of Karnataka etc. and are widely scattered in other regions.

5. **Forest-Mountain Soil-** These soils occupy about **2.85 lakh sq km or 8.67% of the total land area** of India. In the **Himalayan region**, such soils are mainly found in valleys, less steep and north facing slopes. The south facing slopes are very steep and exposed to denudation and hence do not support soil formation. Forest soils occur in **Western and Eastern Ghats** also.
6. **Arid- Desert Soil-** They cover a total area of **1.42 lakh sq km (4.32%)**. Occur in arid and semi-arid regions of **Rajasthan, Punjab and Haryana**. The sand here is blown from the Indus basin and the coast by the prevailing south-west monsoon winds. Sandy soils without clay factor are also common in **coastal regions of Odisha, Tamil Nadu and Kerala.**

Several factors influence soil formation in Indian conditions, including parent material, climate, topography, vegetation, and time. These factors contribute to the diverse range of soil types found across the country. The distribution of major soil types, such as alluvial, red and yellow, black, laterite, and arid soils, is influenced by regional variations in geological, climatic, and topographical conditions. Understanding the factors influencing soil formation and the distribution of soil types is essential for sustainable land use planning, agricultural practices, and soil conservation efforts in India.

**Q.2) Give an account of the differences between the Himalayan and Peninsular drainage systems.**

**Answer:** Himalayan Rivers are the water bodies that emanate from the north of Himalayan Mountain ranges. On the other extreme, Peninsular Rivers include those watercourses that arise from, Western Ghats or Central Highlands.

| BASIS FOR COMPARISON | HIMALAYAN RIVERS | PENINSULAR RIVERS |
|---|---|---|
| **Meaning** | Himalayan Rivers are the rivers that originate from Himalayan ranges and flows throughout the year. | Peninsular Rivers include those rivers that arises from Western Ghats and receive water only during a particular period. |
| **Nature** | Perennial | Non-perennial |
| **Delta Formation** | Delta formation | Some rivers form deltas while others form Estuary |
| **Shape** | Meandering | Straight |
| **Rocks** | Bed rocks are soft, sedimentary and easily erodible | Bed rocks are hard, resistant and not easily erodible |
| **Fed by** | Snow and rain | Rain |
| **Drainage basin** | Large | Small |
| **Irrigate** | Northern Plains | Deccan Plateau |
| **Valley** | V-shaped valley is formed | U-shaped valley is formed |

Himalayan rivers are perennial and come from high altitude with high speed, and have large and deep courses. **Indus , Ganga, Brahmaputra are** the main rivers of the Himalaya Rivers System. Peninsular Rivers are broad, stable and flow through shallow valleys. **Narmada, Tapi, Godavari, Krishna, Cauvery and Mahanadi are** the main Peninsular Rivers.

The Himalayan and Peninsular drainage systems differ in terms of their geological origin, river courses, river characteristics, basin sizes, and sediment transport. While the Himalayan rivers are young, fast-flowing, and carry abundant sediment, the Peninsular rivers are more mature, exhibit complex patterns, and have smaller river basins. Understanding these differences is crucial for assessing water availability, flood management, and harnessing the potential of these river systems for various purposes.

## Objective Questions:

**Q.1)** With reference to effect of soil on local temperature, consider the following statements:
1. Light soils reflect more heat than darker ones.
2. Dry soils like sands are more sensitive to temperature changes than wet soils.
Which of the statements given above is/are correct?

- ☐ a) 1 only
- ☐ b) 2 only
- ☐ c) Both 1 and 2
- ☐ d) Neither 1 nor 2

**Ans) c**
**Exp) Option c is correct.**
**Statement 1 is correct. Light soils reflect more heat than darker ones.** Such differences give rise to slight variations in the temperature of the region. Regions of light-coloured soil are thus comparatively at lower temperature than those of darker soils.
**Statement 2 is correct. Dry soils like sands are very sensitive to temperature.** They heat up and cool down rapidly, hence the extreme temperature variations in desert areas. Wet soils like clay retain much more moisture, thus they do not warm up or cool down rapidly due to the higher specific heat capacity of water.

**Q.2)** Which of the following is **incorrect** with reference to Peaty soil?

- ☐ a) These soils are found in the areas of heavy rainfall and high humidity.
- ☐ b) Peaty soils are rich in humus and organic content.
- ☐ c) The phosphate content of these soils is as high.
- ☐ d) These soils are not common in floodplains due to the periodic scouring that occurs during flood events.

**Ans) c**
**Exp) Option c is correct.**

Peaty Soils are found in the areas of heavy rainfall, where there is a good growth of vegetation. It occurs widely in the northern part of Bihar, southern part of Uttaranchal and the coastal areas of West Bengal, Orissa and Tamil Nadu.

**Statement a is correct. They are found in the areas of heavy rainfall and high humidity**, where there is a good growth of vegetation.

**Statement b is correct**. Large quantity of dead organic matter accumulates in these areas, and **this gives a rich humus and organic content to the soil.** Organic matter in these soils may go even up **to 40-50 per cent**. These soils are normally heavy and black in colour. At many places, they are alkaline also. It occurs widely in the northern part of Bihar, southern part of Uttarakhand and the coastal areas of West Bengal, Odisha and Tamil Nadu.

**Statement c is incorrect**. **They are deficient in phosphate and potash.** Arid desert soils have high phosphate content.

**Statement d is correct**. Peaty soils have a thick layer (>40 cm) of organic matter accumulation, representing the long periods of saturation on an annual basis. These soils typically occur in depressional settings and **are not common in floodplains due to the periodic scouring that occurs during flood events.**

**Q.3)** Consider the following statements with respect to the Black soil:

1. It is highly retentive of moisture.
2. They are rich in phosphorous, nitrogen and organic matter.
3. Black soils of uplands are of low fertility, but they are fertile in the valleys.
4. Cotton, millets and sugarcane are some of the important crops grown in this soil.

Which of the statements given above are correct?

- ☐ a) 1, 3 and 4 only
- ☐ b) 1, 2 and 3 only
- ☐ c) 1 and 3 only
- ☐ d) 4 only

**Ans) a**

**Exp) Option a is correct.**

The Black soils are generally clayey, deep and impermeable. Black soil covers most of the Deccan Plateau which includes parts of Maharashtra, Madhya Pradesh, Gujarat, Andhra Pradesh and some parts of Tamil Nadu.

**Statement 1 is correct.** Black Soil swell and become sticky when wet and shrink when dried. So, during the dry season, these soils develop wide cracks. Thus, there occurs a kind of 'self-ploughing'. Because of this character of slow absorption and loss of moisture, the black soil retains the moisture for a very long time, which helps the crops, especially, the rain fed ones, to sustain even during the dry season.

**Statement 2 is incorrect.** Chemically, the black soils are rich in lime, iron, magnesia and alumina. They also contain potash. But they lack in **phosphorous, nitrogen and organic matter**. The colour of the soil ranges from deep black to grey.

**Statement 3 is correct.** In all regur soils in general, and in those derived from ferromagnesian schists in particular, there is a layer rich in kankar nodules formed by segregation of calcium carbonate at lower depths. **As a general rule, black soils of uplands are of low fertility but they are darker, deeper and richer in the valleys.**

**Statement 4 is correct.** Because of their high fertility and retentivity of moisture, the black soils are widely used for producing several important crops. Some of the major crops grown on the black soils are cotton, wheat, jowar, linseed, Virginia tobacco, castor, sunflower and millets. **Rice and sugarcane** are equally important where irrigation facilities are available. Large varieties of vegetables and fruits are also successfully grown on the black soils.

**Q.4)** Which of the following hills/range depict the radial form of drainage pattern?

- ☐ a) Nilgiri Hills
- ☐ b) Kumaon Hills
- ☐ c) Sahyadari Hills
- ☐ d) Amarkantak range

**Ans) d**
**Exp) Option d is correct.**
**Option a and b are incorrect. Kumaon and Nilgiri hills show annular drainage pattern**. In such a pattern, the radial streams develop subsequent tributaries which try to follow a circular drainage around the summit.
**Option c is incorrect.** Sahyadari hills show dendritic drainage pattern. River Krishna originates from these hills.
**Option d is correct. When the rivers originate from a hill and flow in all directions, the drainage pattern is known as 'radial'.** Rivers like **Narmada, Son and Mahanadi originating from Amarkantak range flow** in different directions and are good examples of radial patterns. **This pattern is also found in the Girnar Hills of Gujarat and Mikir Hills of Assam.**

**Q.5)** Consider the following statements:
1. In an antecedent drainage pattern, the river cuts through uplifted portions of land.
2. In a superimposed drainage pattern, the river flows in relation to the topology of the area.
3. In a concordant drainage pattern, the river cuts through the exposed rock strata and maintains its initial path.
Which of the statements given above is/are correct?

- ☐ a) 1 only
- ☐ b) 1 and 2 only
- ☐ c) 2 and 3 only
- ☐ d) 1, 2 and 3

**Ans) a**
**Exp) Option a is correct.**
**1) Antecedent – Even when a part of the river slope gets uplifted, the river sticks to its original slope by cutting through the uplifted land.** The river has strong capacity for vertical erosion. Himalayan rivers such as The Indus, The Ganga, The Brahmaputra are examples of antecedent rivers.
**2) Superimposed** – The river originally flows on a soft rock bed and over time it exposes an underlying region of hard rock. **The river sticks to its original path by cutting through the exposed landform.** Examples include The Damodar, The Subarnarekha, The Chambal etc.
**3) Concordant – The river flows in accordance with the topography and geology of the drainage region.** The path of the river is highly dependent on the slope, the arrangement of rocks, the hardness/softness of rocks etc. Peninsular rivers are examples of concordant drainage pattern.