

4. Map Projections

Exercise

1. Choose the right answer from the four alternatives given below:

(i) A map projection least suitable for the world map:

- (a) Mercator
- (b) Simple Cylindrical
- (c) Conical
- (d) All the above

Answer: (c) Conical

(ii) A map projection that is neither the equal area nor the correct shape and even the directions are also incorrect

- (a) Simple Conical
- (b) Polar zenithal
- (c) Mercator
- (d) Cylindrical

Answer: (c) Mercator

(iii) A map projection having correct direction and correct shape but area greatly exaggerated polewards is

- (a) Cylindrical Equal Area
- (b) Mercator
- (c) Conical
- (d) All the above

Answer: (b) Mercator

(iv) When the source of light is placed at the centre of the globe, the resultant projection is called

- (a) Orthographic
- (b) Stereographic
- (c) Gnomonic
- (d) All the above

Answer: (c) Gnomonic

2. Answer the following questions in about 30 words:

(i) Describe the elements of map projection.

Answer: Reduced earth, parallels of latitude, meridians of latitude and gross property are four elements of map projections.

(ii) What do you mean by global property?

Answer: The correctness of area, shape, direction and distances are the four major global properties.

(iii) Not a single map projection represents the globe truly. Why?

Answer: In preparing a map projection the distance between any given points of a region; shape of the region; size or area of the region in accuracy; and direction of any one point of the region bearing to another point are to be preserved by using one or the other methods of projections. But none of the projections can maintain all these properties simultaneously. Therefore, not a single map projection represents the globe truly.

(iv) How is the area kept equal in cylindrical equal area projection?

Answer: The cylindrical equal area projection has been derived by projecting the surface of the globe with parallel rays on a cylinder touching it at the equator. Both the parallels and meridians are projected as straight lines intersecting one another at right angles. The pole is shown with a parallel equal to the equator; hence, the shape of the area gets highly distorted at the higher latitude.

3. Differentiate between—

(i) Developable and non-developable surfaces

Answer:

Developable surfaces	Non-developable surfaces
Can be flattened, and on which, a network of latitude and longitude can be projected	Cannot be flattened without shrinking, breaking or creasing

A globe or spherical surface has the property of non-developable surface.	A cylinder, a cone and a plane have the property of developable surface.
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(ii) Homolographic and orthographic projections

Answer:

Homolographic projection	Orthographic projection
It is an Equal Area Projection.	It is True-Shape projection.
Areas of various parts of the earth are represented correctly.	Shapes of various areas are portrayed correctly and maintained at the cost of the correctness of area.

(iii) Normal and oblique projections

Answer:

Normal projections	Oblique projections
In the normal projection, the developable surface touches the globe at the equator.	In the oblique projection, the developable surface touches tangential to a point between the pole and the equator.

(iv) Parallels of latitude and meridians of longitude

Answer:

Parallels of Latitude	Meridians of Longitude
They are demarcated as 0° to 90° North and South latitudes.	There is no central meridian
Each parallel lies wholly in its plane which is at right angle to the axis of the earth.	Each meridian lies wholly in its plane, but all intersect at right angle along the axis of the globe.

These are the circles running round the globe parallel to the equator.	These are semi-circles drawn in north south direction from one pole to the other.
They are not of equal length.	They are of equal length.

4. Answer the following questions in not more than 125 words:

(i) Discuss the criteria used for classifying map projection and state the major characteristics of each type of projection.

Answer: Map Projections may be classified on the following bases:

A. Drawing Techniques: On the basis of method of construction, projections are classified as follows:

i. Perspective projections are developed with the help of a source of light.ii. Non–perspective projections are developed without the help of a source of light.

iii. Mathematical projections are derived by mathematical computation, and formulae.

Developable Surface: A developable surface is a geometric shape that can be laid out into a flat surface without stretching or tearing. The three types of developable surfaces are cylinder, cone and plane, and their corresponding projections are called cylindrical, conical and planar.

Global Properties: The correctness of area, shape, direction and distances are the four major global properties to be preserved in a map. On the basis of global properties, projections are classified into equal area, orthomorphic, azimuthal and equi-distant projections.

Source of Light: On the basis of location of source of light, projections may be classified as gnomonic, stereographic and orthographic. These projections are obtained by putting the light at the centre of the globe or at the periphery of the globe or at infinity from the globe.

(ii) Which map projection is very useful for navigational purposes? Explain the properties and limitations of this projection.

Answer: Mercator’s Projection is an orthomorphic projection in which the correct shape is maintained. It has the characteristics of showing correct directions. Therefore, it is very useful for navigation purposes showing sea routes and air routes.

Properties

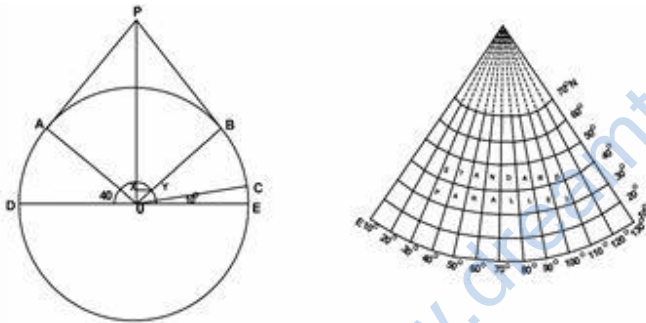
- i. All parallels and meridians are straight lines.
- ii. All parallels are equal to the length of equator.
- iii. All meridians have the same length and equal spacing.
- iv. Scale along the equator is correct.
- v. The shape of small countries increases towards pole

Limitations

- i. There is greater exaggeration of scale along the high latitude For example, the size of Greenland equals to the size of USA.
- ii. Poles in this projection cannot be shown as the poles lie at infinity

(iii) Discuss the main properties of conical projection with one standard parallel and describe its major limitations.

Answer: A conical projection with one standard parallel is drawn by projecting the image of the graticule of a globe on a developable cone, which touches the globe along a parallel of latitude called the standard parallel.



Properties

1. All the parallels are arcs of concentric circle and are equally spaced.
1. All meridians are straight lines merging at the pole and intersect the parallels at right angles.
2. The scale along all meridians is true.
3. The scale is true along the standard parallel but exaggerated away from the standard parallel.
4. Meridians become closer to each other towards the pole.

Limitations

1. A conical projection with one standard parallel is not suitable for a world map as distortion is moderate for one hemisphere, but becomes extreme in the hemisphere opposite one in which the standard parallel is selected
2. It is not suitable for representing larger areas within the hemisphere as the distortion along the pole and near the equator is large

