Karnataka State Open University

Department Of Studies In Geography

Manasagangotri, Mysore - 570 006

M.Sc. GEOGRAPHY

Second Semester

CARTOGRAMS AND WEATHER CHARTS

(Practical)

COURSE - 205 **BLOCK - 1,2,3 and 4**

ಕರಾಮುವಿ

ರಾಷ್ಟ್ರೀಯ
ಅಂತಾರಾಷ್ಟ್ರೀಯ
ಮಾನ್ಯತೆ

- ಕರ್ನಾಟಕ ರಾಜ್ಯ ಮುಕ್ತ ವಿಶ್ವವಿದ್ಯಾನಿಲಯವು ಜೂನ್ ೧, ೧೯೯೬ ರಂದು ಸರ್ಕಾರಿ ಆದೇಶ ಸಂಖ್ಯೆ : ED1/UOV/dated 12 February 1996 (Karnataka State Open University Act - 1992) ರ ಪ್ರಕಾರ ಕರ್ನಾಟಕ ರಾಜ್ಯಪಾಲರ ಅನುಮೋದನೆಯೊಂದಿಗೆ ಪೂರ್ಣಪ್ರಮಾಣದ ವಿಶ್ವವಿದ್ಯಾನಿಲಯವಾಗಿ ಸ್ಥಾಪನೆಗೊಂಡಿತು. ರಾಜ್ಯದ ಶೈಕ್ಷಣಿಕ ಪದ್ಧತಿಯಲ್ಲಿ 'ದೂರ ಶಿಕ್ಷಣ ಪದ್ಧತಿ'ಯನ್ನು ಆರಂಭಿಸುವ ಮತ್ತು ಉತ್ತೇಜಿಸುವ ದೃಷ್ಟಿಯಿಂದ ಈ ಮುಕ್ತ ವಿಶ್ವವಿದ್ಯಾನಿಲಯವನ್ನು ಅಧಿನಿಯಮದ ಮೂಲಕ ಸ್ಥಾಪಿಸಲಾಯಿತು.
- ಕರ್ನಾಟಕ ರಾಜ್ಯ ಮುಕ್ತ ವಿಶ್ವವಿದ್ಯಾನಿಲಯದ ಅಧಿನಿಯಮ ೧೯೯೫ ರಂತೆ ಈ ವಿಶ್ವವಿದ್ಯಾನಿಲಯವು ಕರ್ನಾಟಕ ರಾಜ್ಯದ ಒಳಗೆ ಸಂಸ್ಥೆಗಳನ್ನು, ಕಾಲೇಜುಗಳನ್ನು, ಪ್ರಾದೇಶಿಕ ಕೇಂದ್ರಗಳನ್ನು ಮತ್ತು ಅಧ್ಯಯನ ಕೇಂದ್ರಗಳನ್ನು ಸ್ಥಾಪಿಸುವ, ನಿರ್ವಹಿಸುವ ಮತ್ತು ಮಾನ್ಯತೆ ಕೊಡುವ ಅಧಿಕಾರವನ್ನು ಹೊಂದಿದೆ. ಅಗತ್ಯವಿದ್ದ ಸಂದರ್ಭಗಳಲ್ಲಿ ಕರ್ನಾಟಕ ರಾಜ್ಯದ ಹೊರಗಿನ ಸ್ಥಳಗಳಲ್ಲೂ ಪ್ರಾದೇಶಿಕ ಕೇಂದ್ರ ಮತ್ತು ಅಧ್ಯಯನ ಕೇಂದ್ರಗಳನ್ನು ತೆರೆಯಲು ಅಧಿಕಾರವನ್ನು ಪಡೆದಿದೆ.
- ಕರ್ನಾಟಕ ರಾಜ್ಯ ಮುಕ್ತ ವಿಶ್ವವಿದ್ಯಾನಿಲಯದ ಎಲ್ಲಾ ಶೈಕ್ಷಣಿಕ ಕಾರ್ಯಕ್ರಮಗಳು 'ದೂರ ಶಿಕ್ಷಣ ಮಂಡಳಿ' (DEC), ಮಾನವಸಂಪನ್ಮೂಲ ಅಭಿವೃದ್ಧಿ ಸಚಿವಾಲಯ (MHRD), ನವದೆಹಲಿಯ ಮಾನ್ಯತೆಯನ್ನು ಪಡೆದಿವೆ.
- ಕರ್ನಾಟಕ ರಾಜ್ಯ ಮುಕ್ತ ವಿಶ್ವವಿದ್ಯಾನಿಲಯವು ೧೯೯೯ರಿಂದ ನವದೆಹಲಿಯಲ್ಲಿರುವ 'ಭಾರತೀಯ ವಿಶ್ವವಿದ್ಯಾನಿಲಯಗಳ ಸಂಘ'ದ (AIU) ಖಾಯಂ ಸದಸ್ಯತ್ವವನ್ನು ಹೊಂದಿದೆ.
- ಕರ್ನಾಟಕ ರಾಜ್ಯ ಮುಕ್ತ ವಿಶ್ವವಿದ್ಯಾನಿಲಯವು ೧೯೯೯ರಿಂದ 'ಕಾಮನ್‌ವೆಲ್ತ್ ವಿಶ್ವವಿದ್ಯಾನಿಲಯಗಳ ಸಂಘ' (ACU), ಲಂಡನ್, ಯುನೈಟೆಡ್ ಕಿಂಗ್‌ಡಮ್‌ನ ಶಾಶ್ವತ ಸದಸ್ಯ ಸಂಸ್ಥೆಯಾಗಿದೆ. ಸದಸ್ಯತ್ವದ ಸಂಖ್ಯೆ : ZKASOPENUINI.
- ಕರ್ನಾಟಕ ರಾಜ್ಯ ಮುಕ್ತ ವಿಶ್ವವಿದ್ಯಾನಿಲಯವು ೧೯೯೪ ರಿಂದ 'ಏಷಿಯಾದ ಮುಕ್ತ ವಿಶ್ವವಿದ್ಯಾನಿಲಯಗಳ ಸಂಘ' (AAOU), ಬೀಜಿಂಗ್, ಚೀನಾ – ಇದರ ಶಾಶ್ವತ ಸದಸ್ಯ ಸಂಸ್ಥೆಯಾಗಿದೆ.
- ಕರ್ನಾಟಕ ರಾಜ್ಯ ಮುಕ್ತ ವಿಶ್ವವಿದ್ಯಾನಿಲಯವು 'ಕಾಮನ್‌ವೆಲ್ತ್ ಆಫ್ ಲರ್ನಿಂಗ್' (COL) ಕೆನಡ, ಇದರ ಸಹಯೋಗವನ್ನು ೨೦೦೩ ರಿಂದ ಹೊಂದಿದೆ. 'ಕಾಮನ್‌ವೆಲ್ತ್ ಆಫ್ ಲರ್ನಿಂಗ್' ಎನ್ನುವುದು ದೂರ ಶಿಕ್ಷಣದಲ್ಲಿ ಮುಕ್ತಕಲಿಕಾ ತಿಳಿವಳಿಕೆ, ಸಂಪನ್ಮೂಲಗಳು ಮತ್ತು ತಂತ್ರಜ್ಞಾನಗಳ ಅಭಿವೃದ್ಧಿ ಮತ್ತು ಹಂಚುವಿಕೆಗಳನ್ನು ಪ್ರೋತ್ಸಾಹಿಸುವ ಉದ್ದೇಶದಿಂದ ಕಾಮನ್‌ವೆಲ್ತ್ ದೇಶಗಳ ಸರ್ಕಾರಗಳಿಂದ ನಿರ್ಮಾಣಗೊಂಡ ಅಂತಾರಾಷ್ಟ್ರೀಯ ಸರ್ಕಾರಿ ಸಂಸ್ಥೆಯಾಗಿದೆ.

ಉನ್ನತ ಶಿಕ್ಷಣ ಎಲ್ಲರಿಗೂ ಎಲ್ಲೆಡೆ

Karnataka State Open University
Manasagangotri, Mysore-6

M.Sc.
GEOGRAPHY
Course - 205
Cartograms and Weather charts
Practical - II

Department of Studies in Geography

Course Design and Editorial Committee

Prof. K.S.Rangappa
Vice-Chancellor & Chairperson
Karnataka State Open University
Manasagangotri, Mysore – 570 006

Prof. S.N. Vikram Raj Urs
Dean (Academic) & Convenor
Karnataka State Open University
Manasagangotri, Mysore – 570 006

Course Co-Ordinators

Dr. Y.P. Chandrashekara
Department of Studies in Geography
Karnataka State Open University
Manasagangotri, Mysore – 570 006

Subject Co-Ordinator

Dr. B.N. Shivalingappa
Professor
Department of Studies in Geography
University of Mysore
Manasagangotri, Mysore – 570 006

Course Writer — **Unit 1 - 4**

Dr. B. Chandrashekara
Associate Professor
Department of Studies in Geography
University of Mysore
Manasagangotri, Mysore – 570 006

Publisher

Registrar
Karnataka State Open University
Manasagangotri, Mysore - 6.

Developed by Academic Section, KSOU, Mysore
Karnataka State Open University, 2012

Further information on the Karnataka State Open University Programmes may obtained from the University's office at Manasagangotri, Mysore-6

Printed and Published on behalf of Karnataka State Open University. Mysore-6 by **Registrar (Administration)**

INTRODUCTION

The cartograms and weather chart is a practical paper which is fundamental tools in geographical enquiry. Therefore, it is meaningful to study these tools and acquaint with the techniques. These techniques are very useful in representing the Qualitative and Quantitative aspects of several variables of phenomena across the space.

The present work is organized in four broad units such as Map Types, Spatial Analytical Techniques and Interpretation of Indian daily weather report for summer and winter season. The first unit focuses on the fundamental aspects of map types which are very crucial in interpretation of both natural and manmade features of a particular area. This unit attempts to introduce the techniques like Isopleths, Choropleth and dot maps to represent the Quantity or Proportion of some phenomena with appropriate local case studies.

The second unit attempts to introduce some of the spatial analytical tools such as Nearest neighbour analysis, Gravity Potential model, Rank size rule and Location quotient. These techniques are very effective in representing the distribution and spatial pattern of distribution of any phenomena. Further these techniques are also widely used to show the level and strength of interaction among different towns and cities and even it also gives us the degree of concentration or dispersal of any phenomena.

The third and fourth unit introduces you to know the importance and uses of weather charts. In addition to this it also focuses to familiarize the signs and symbols among the student community, which are considered indispensible tools in interpretation as well as forecast of weather phenomena. These techniques need more practice to become an efficient and effective interpreter of weather phenomena.

UNIT - 1: MAP TYPES: ISOPLETH AND DOT METHOD

Structure:

1.0 OBJECTIVES

After studying this unit, you will able to

- Know the fundamental aspects of map types
- Identify the crucial in interpretation of both natural and manmade features of a particular area.
- Classify the maps and its types are even necessary for advanced research studies.

1.1 INTRODUCTION

Most maps can be classified into two main groups like:

- General purpose maps and
- Thematic maps.

1.1.1 General purpose maps: These maps are often used for reference purposes and can exhibit a variety of information including physical land features and political boundaries. Examples of general purpose maps include those found in a standard geographic atlas, or road maps.

1.1.2 Thematic (or special-purpose) maps: These are typically used to convey a specific theme to a particular audience. A map of the Indian States in which the colour of a state represents its census population, is an example of a thematic map.

There are types of maps which do not fall into either of the two main categories, or which exhibit properties of both. Since maps can display multiple levels of information, the separation between different types of maps is not always clear. In addition, maps have uses in varied fields, and as such, sometimes terminology may seem conflicting.

1.2 GENERAL PURPOSE MAPS

1.2.1. Topographic Maps

The most common type of general purpose map is a topographic map. Topographic maps are often used as reference maps, and typically display both natural land features (such as coastlines and bodies of water) as well as political boundaries. Topographic maps also display elevation (height above sea level), using either coloring (relief shading) or contour lines. The Survey of India (SOI) produces topographic maps in a series, and at standard map scales (such as 1: 2, 50,000).

1.2.2 Planimetric Maps

Planimetric maps are two-dimensional maps which are similar to topographic maps, but do not show any elevation. Planimetric maps tend to display natural features such as lakes and rivers, or man-made features such as roads and city boundaries. These types of maps can serve as the basis for cadastral maps which document the boundaries and ownership of parcels of land.

1.2.3 Base Maps

Base maps act as a foundation for superimposing additional layers of information. For example, a thematic map can be constructed from a base map using a specific colorization scheme. A base map typically contains some natural features such as coastlines, and some man-made features such as political boundaries.

1.3 THEMATIC MAPS

A thematic map shows how **qualitative** and **quantitative** data are distributed geographically. Thematic maps usually build on top of a base map in order to convey a specific geographic theme, such as population by state, or sales per region.

1.3.1 Qualitative Thematic Maps

Qualitative thematic maps are also known as descriptive maps. Examples of descriptive maps include region, path, facility, and resource maps.

1.3.2 Quantitative Thematic Maps

Quantitative thematic maps are also known as statistical maps and use a visual mechanism, such as colour, to indicate the quantity of a data attribute at different locations on a map. Examples of this type of map are discussed below.

1.4 CHOROPLETH MAPS

These maps use a uniform colour or pattern to fill a geographical shape on a map according to the quantity of a data attribute associated with that shape. For example, a choropleth population map of the India might assign the colour green to all states with a population of between 10 and 20 million people.

The choropleth maps are also drawn to depict the data characteristics as they are related to the administrative units. These maps are used to represent the density of population, literacy/growth rates, sex-ratio, etc.

1.4.1 Requirement for drawing Choropleth Map:

(a) A map of the area depicting different administrative units.

(b) Appropriate statistical data according to administrative units.

1.4.2 Steps to be followed:

(a) Arrange the data in ascending or descending order.

(b) Group the data into 5 categories to represent very high, high, medium, low and very low concentrations.

(c) The interval between the categories may be identified on the following formulae i.e.Range/5 and Range = maximum value – minimum value.

(d) Patterns, shades or colour to be used to depict the chosen categories should be marked in an increasing or decreasing order.

1.4.3 Construction:

(a) Arrange the data in ascending order as shown above.

(b) Identify the range within the data. In the present case, the states recording the lowest and highest literacy rates are Bihar (47%) and the Kerala (90.9%) respectively. Hence, the range would be 91.0 – 47.0 = 44.0

(c) Divide the range by 5 to get categories from very low to very high. (44.0/ 5 = 8.80). We can convert this value to a round number 9.0.

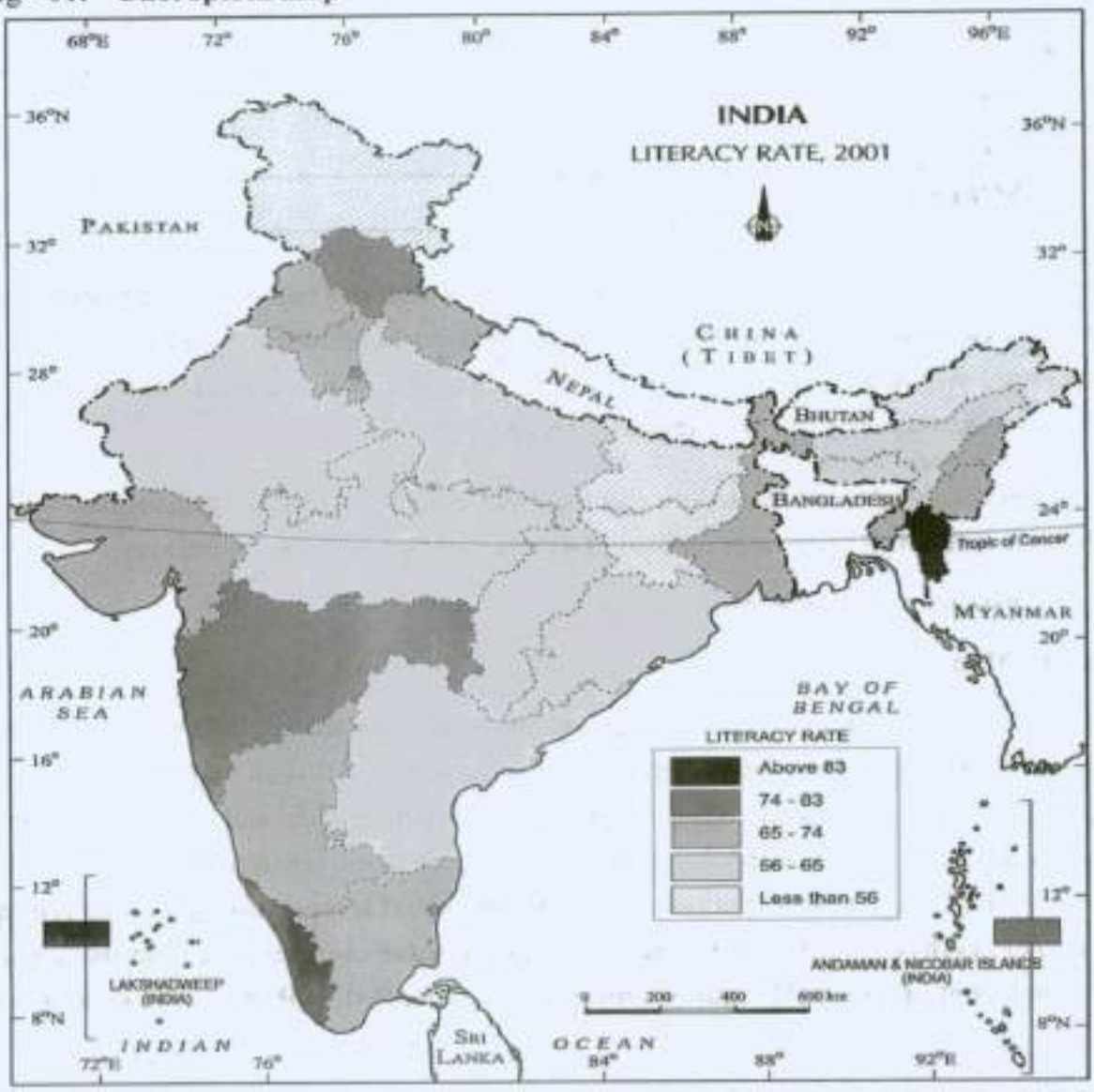
(d) Determine the number of the categories along with range of each category. Add 9.0 to thelowest value of 47.0 as so on. We will finally get following categories: 47 – 56 Very low (Bihar, Jharkhand, Arunachal Pradesh, Jammu and Kashmir) 56 – 65 Low (Uttar Pradesh, Rajasthan, Andhra Pradesh, Meghalaya, Orissa, Assam, Madhya Pradesh, Chhattisgarh)65 – 74 Medium (Nagaland, Karnataka, Haryana, West Bengal, Sikkim, Gujarat, Punjab, Manipur, Uttaranchal, Tripura, Tamil Nadu) 74 – 83 High (Himachal Pradesh, Maharashtra, Delhi, Goa) 83 – 92 Very High (Mizoram, Kerala)

(e) Assign shades/pattern to each category ranging from lower to higher hues.

(f) Prepare the map as shown in Fig.

(g) Complete the map with respect to the attributes of map design.

Fig - 01. **Choropleth map**



1.4.4 Disadvantages of Choropleth Maps:

Although choropleth give a good visual impression of change over space there are certain disadvantages to using them:

- They give a false impression of abrupt change at the boundaries of shaded units.

- Choropleth are often not suitable for showing total values. Proportional symbols overlays (included on the choropleth map above) are one solution to this problem.
- It can be difficult to distinguish between different shades.
- Variations within map units are hidden, and for this reason smaller units are better than large ones.

1.5 ISOPLETH MAPS

Isopleth maps also use colour, except that the boundaries between colours areas are defined by Isolines representing points with equal data attribute values. A typical weather or temperature map is an example of an isopleth map. Isopleth maps are ideal when your data values vary continuously and smoothly over space.

The disadvantage of isopleths is that they are unsuitable for showing discontinuous or 'patchy' distributions and a large amount of data is required for accurate drawing.

1.5.1 Construct a Isopleths Map:

Isopleth Map

Variations in the degrees of slope, temperature, occurrence of rainfall, may be represented by drawing the lines of equal values on a map. All such maps are termed as Isopleth Map. The word Isopleth is derived from Iso meaning equal and pleth means lines. Thus, an imaginary line, which joins the places of equal values, is referred as Isopleth. The more frequently drawn isopleths include **Isotherm (equal temperature), Isobar (equal pressure), Isohyets (equal rainfall), Isonephs (equal cloudiness), Isohels (equal sunshine), contours (equal heights), Isobaths (equal depths), Isohaline (equal salinity), etc.**

1.5.2 Requirements for Drawing Isopleths Maps:

(a) Base line map depicting point location of different places.

(b) Appropriate data of temperature, pressure, rainfall, etc. over a definite period of time.

(c) Drawing instrument specially French Curve, etc.

1.5.3 Rules to be followed:

(a) An equal interval of values be selected.

(b) Interval of 5, 10, or 20 is supposed to be ideal.

(c) The value of Isopleth should be written along the line on either side or in the middle by breaking the line.

1.5.4 Interpolation

Interpolation is used to find the intermediate values between the observed values of at two stations/locations. Generally, drawing of isopleths joining the places of same value is also termed as interpolation.

1.5.5 Method of Interpolation

For interpolation, follow the following steps:

(a) Firstly, determine the minimum and maximum values given on the map.

(b) Calculate the range of value i.e. Range = maximum value – minimum value.

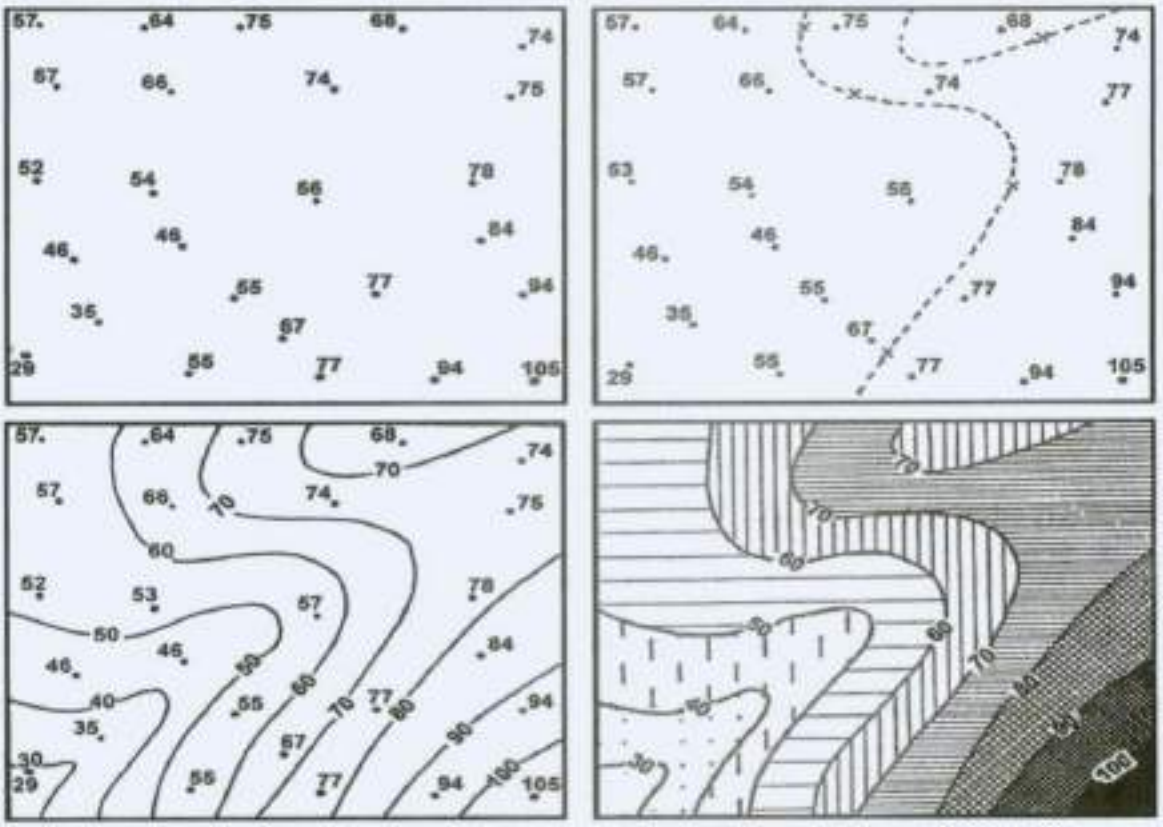
(c) Based on range, determine the interval in a whole number like 5, 10, 15, etc.

The exact point of drawing an Isopleth is determined by using the following formulae.

$$\text{Point of Isopleth} = \frac{\text{Distance between two points in cm}}{\text{Difference between the two values of corresponding points}} \times \text{Interval}$$

The interval is the difference between the actual value on the map and interpolated value. For example, in an Isotherm map of two places show 28° C and 33° C and you want to draw 30°C isotherm, measure the distance between the two points. Suppose the distance is 1cm or 10 mm and the difference between 28 and 33 is 5, thus, exact point of 30 will be plotted 4mm away from 28°C or 6mm ahead of 33°C.

Fig. 1.2 Drawing of Isopleth maps.



1.6 PROPORTIONAL SYMBOL MAPS

These maps are use scaled symbols or icons in order to indicate the relative quantity of a particular data attribute. A larger symbol, for example, indicates a larger data value for a location on the map. Other techniques involve the use of symbols such as bar or pie indicators in which the actual size of each symbol is fixed, but the ymbol appearance varies proportionally with the data attribute value. For example, given a larger data value, a larger slice of a pie indicator would be drawn.

1.6.1 Dot (or dot density) maps

These maps use a fixed size dot symbol on a map in order to represent a fixed quantity of data. For example, a single dot symbol on a population map could represent one million people. If you then view a map of the Indian States which is constructed using such symbols, you will see that areas of high dot density indicate regions of greater population while low dot density areas indicate sparsely populated regions.

1.6.2 Requirement

(a) An administrative map of the given area showing state/district/block boundaries.

(b) Statistical data on selected theme for the chosen administrative units, i.e., total population, cattle etc.

(c) Selection of a scale to determine the value of a dot.

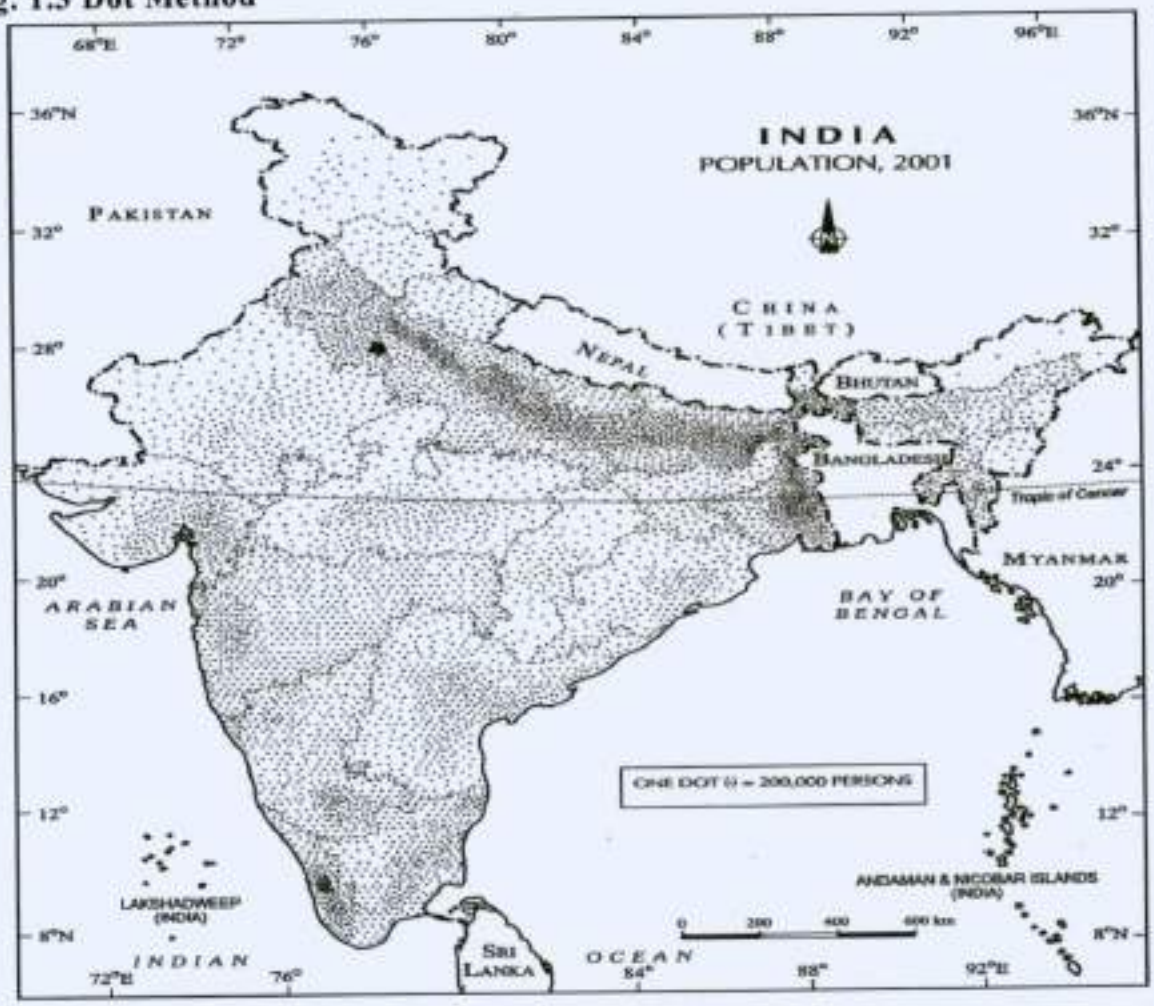
(d) Physiographic map of the region especially relief and drainage maps.

1.6.3 Precaution

(a) The lines demarcating the boundaries of various administrative units should not be very thick and bold.

(b) All dots should be of same size.

Fig. 1.3 Dot Method



1.6.4 Construction:

(a) Select the size and value of a dot.

(b) Determine the number of dots in each state using the given scale. For example, number of dots in Maharashtra will be 9, 67, 52,247/100,000 = 967.52. It may be rounded to 968, as the fraction is more than 0.5.

(c) Place the dots in each state as per the determined number in all states.

(d) Consult the physiographic/relief map of India to identify mountainous, desert, and/or snow covered areas and mark lesser number of dots in such areas.

1.7 KEY WORDS

Isopleths: it is a method of drawing distribution maps. Isopleths are lines of equal value in the form of quantity and density. They are drawn as contour lines at selected interval.

Choropleth: it is a method of drawing distribution maps in which distribution of one element is shown by different shades to represent varying intensity or density.

Dot maps: it is a method of drawing distribution maps in which distribution of one element like population,crops, industrial products, etc is shown by dots of uniform size, each dot represents a certain number or quantity.

1.8 QUESTIONS FOR SELF STUDY

1. Distinguish between general purpose maps and thematic maps.
2. Explain the importance and limitations of Choropleth maps.
3. Show the distribution of population in Karnataka for the year 2001 using choropleth method.
4. What are isopleths maps? How they are different than choropleth maps, explain.
5. Show the spatial variations of mean daily temperature for different districts of Karnataka With the help of an isopleths map.
6. Explain the importance of dot method in preparation of a proportional symbol maps.

1.9 FURTHER READING

Elements of practical Geography (1990) - R.L.Singh

Fundamentals of Cartography (2000) – A.Ramesh and Misra.R.P

http://cimss.ssec.wisc.edu/wxwise/contour/

UNIT – 2: TECHNIQUES OF SPATIAL ANALYSIS

Structure:

2.0 OBJECTIVES

After studying this unit, you will be able to

- understand the importance of spatial analytical techniques.
- acquaint with the methods and procedures for using these techniques in different situations .
- make decision on the relevance of each technique and to select appropriate technique.
- understand the limitations of each techniques.

The spatial analytical techniques are very useful in understanding the spatial pattern of the distribution of any phenomena, its strength of interactions with their neighbours, empirical regularity in size distribution and degree of concentration of any phenomena. In this section we are introducing four important techniques such as

- Nearest Neighbour Analysis
- Gravity potential model
- Rank size rule and
- Location Quotient.

2.1 INTRODUCTION

The Nearest neighbour analysis attempts to present both the logic and the methodology in their simplest terms in the hope that this will encourage the wider, yet prudent, use of a technique that essentially encourages students to think spatially.

Two botanists, P. J. Clark and F. C. Evans, published a paper introducing nearest-neighbour analysis. This technique was conceived as a means of objectively describing and analysing plant distribution patterns, but over the years it has been adopted by a number of other disciplines. In geography, it has been applied principally as a technique for identifying settlement patterns (like uniform, random and clustered) on the basis of measurement of actual nearest neighbour distances between settlements.

2.2 CONCEPT OF THE THEORY

Imagine that the village pattern is traced from a Topographical map of 1/50,000 sheet and that the pattern is shown to a group of students who are asked to describe it. Do the villages cluster together? Are they regularly spaced? Is there no apparent order? Each student will have his own interpretation of the situation and each interpretation is highly likely to differ from the remainder.

Subjective impressions are an obvious problem and it is clear that an objective yardstick is required to reduce them to a minimum. Nearest-neighbour analysis provides this datum by enabling one to predict the average distance that would separate points from their nearest neighbours if the points were located at random throughout an area. This predicted value is normally referred to as $\bar{D}E$ and, once it has been calculated, it can be compared with the observed average distance between nearest neighbours ($\bar{D}obs$) in the pattern under examination.4 Conclusions as to the nature of the real world pattern are based on the formula. The formula is

$$Rn = \bar{D}obs/\bar{r}E, \quad (1)$$

in which Rn represents the nearest-neighbour statistic,

$\bar{D}obs$ refers

$$\bar{D}obs = \frac{\Sigma d_1 \ldots d_n}{n}$$

d = distance between the point and its nearest neighbour

n = the number of points

Σ = the sum of

$\bar{D}obs$, refers average distance observed between nearest neighbours,

$$\bar{r}E = 0{\cdot}5\sqrt{\frac{a}{n}}$$

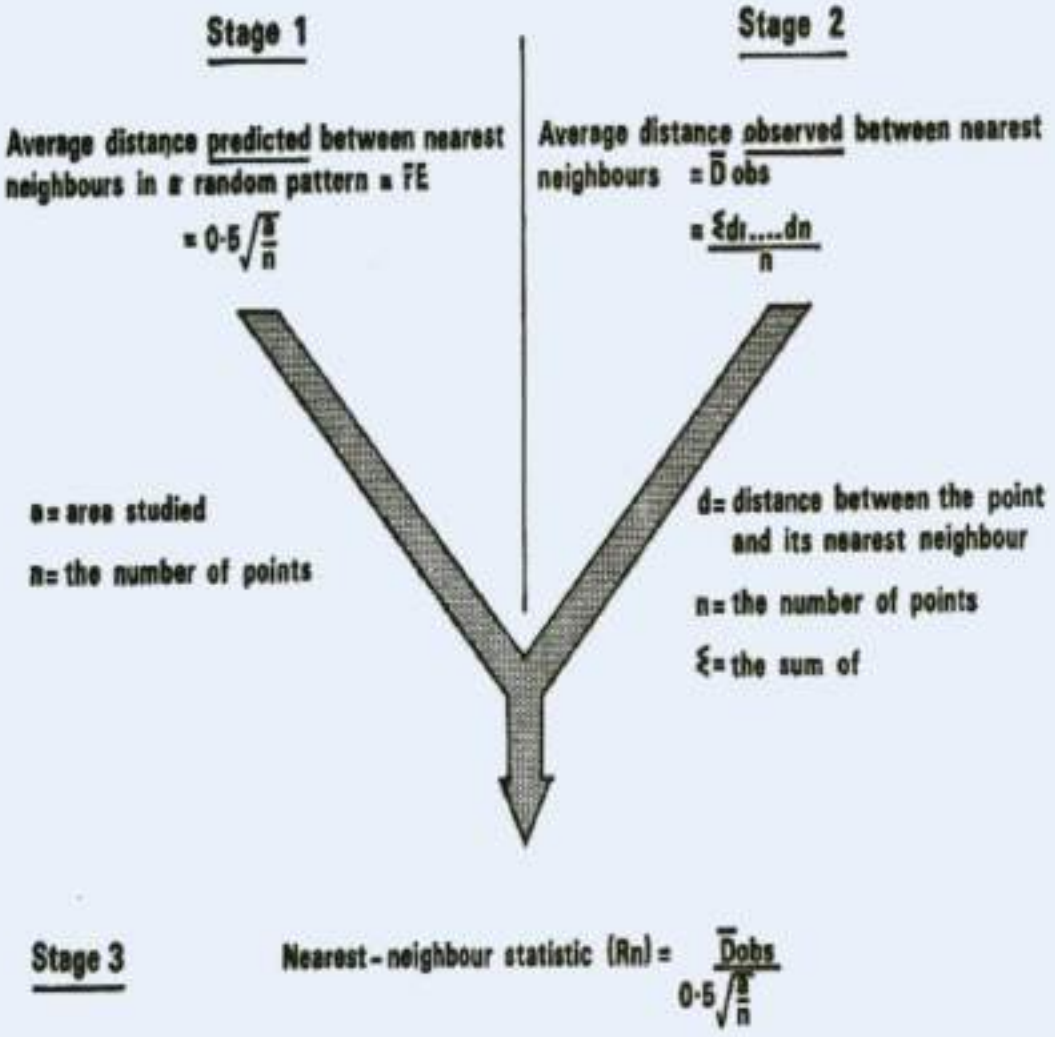
refers (Average distance predicted or expected between nearest neighbours in a random pattern)

a = area studied

n = number of points

It follows from this formula that nearest-neighbour analysis is essentially concerned with assessing the extent of contrasts (ratio)between actual patterns and their theoretical random counterpart.

CALCULATION OF THE NEAREST-NEIGHBOUR STATISTIC



Let us understand this technique with a live example as given below:

The distribution pattern of central villages in Periyapattana taluk is given below. Find out the pattern of distribution using the nearest neighbour technique. (Area =815 Km^2, Scale= 0.4Cm =1Km)

Points of central villages	Nearest neighbour	Distance in Cm
1	2	2.6
2	1	2.6
3	2	3.2
4	5	3.2
5	6	2.2
6	7	1.3
7	6	1.3
8	9	0.6
9	8	0.6
10	13	0.9
11	12	1.2
12	11	1.2
13	10	0.9
14	10	1.2
15	16	1.8
16	15	1.8
17	16	2.9
18	20	2.5
19	20	1.5
20	19	1.5
		Total distance = 35Cm

2.1.2 Steps and Calculation of Nearest neighbour analysis:

1. Get a map (**Fig. 2.1**)of periyapattana taluk of a specific scale (0.4Cm = 1Km or 1Cm =2.5 Km).
2. Mark the location of central villages on the map using small dots and give number for each village.
3. Calculate $\overline{D}obs$ (average distance observed between nearest neighbours) by measuring the actual physical distance between each village and its nearest neighbour by drawing lines to connect each village; divide the total distance by total number of measured pair or points.
4. Prepare the table as shown above (Table No.01)
5. Convert map distance i.e 0.4 Cm into actual ground distance i.e 1Km.

   Therefore 35Cm =X Km, X = 35 X1/0.4

= 87.5 Km.

= Ó d/N = 87.5/20

=4.37 (The average distance observed between nearest neighbours)

6. Calculate the average distance predicted between nearest neighbour in a random pattern

   fE = 0.5v a/n

   Thus, 0.5v815/20

   = 0.5 X 6.38 = 3.19 (Average distance predicted/ expected)

7. Calculate the nearest neighbour statistic (Rn) using

   Thus , 4.37/3.1

$$0.5\sqrt{\frac{a}{n}}$$

Therefore the neighbour statistic (Rn) is 1.36 which is more than 1.0 hence it is obviously the observed average distance is greater than expected. A result of this nature implies that the points tend to be increasingly regularly spaced than in a random situation. However, they are not perfectly regular in distribution.

Fig.2.1 Nearest Neighbour Analysis.

2.1.3 Interpretation of Rn value:

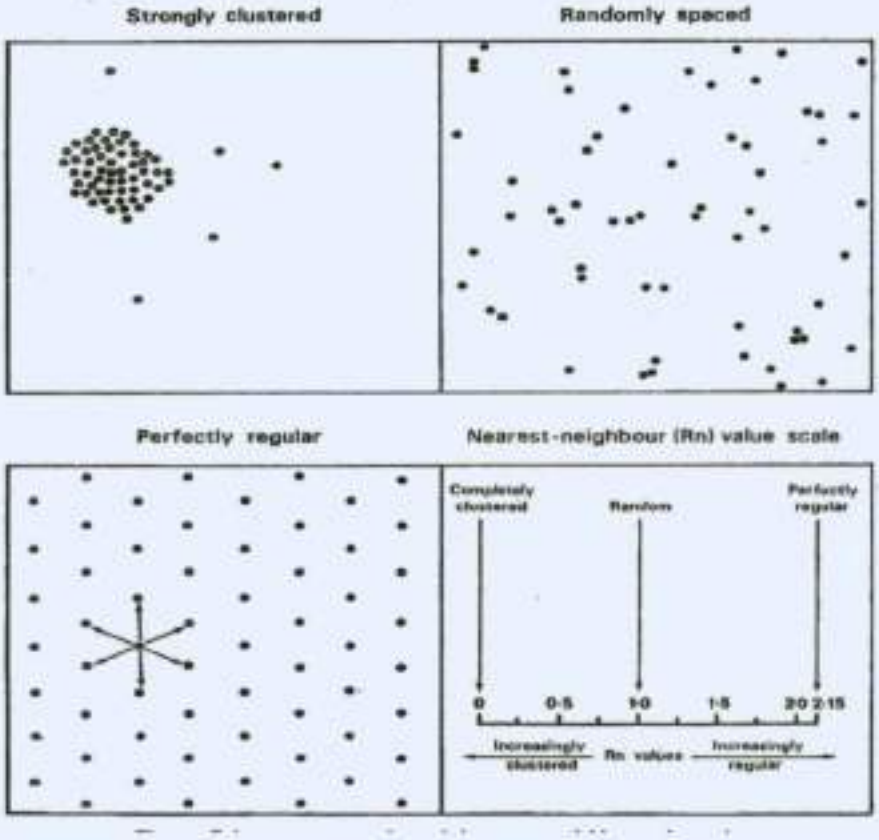
The interpretation of Rn values proceeds briefly as follows. If Rn is equal to 1.0, the two distances (rE and Dobs) are obviously identical and it can be concluded that the location pattern might be the result of forces working at random.

If Rn is less than 1.0, the observed average distance must be small relative to the expected value. In order to achieve this result, the points must be closer together than in a random situation and the pattern is therefore said to be clustered. There are, of course, degrees of clustering and a completely clustered pattern would produce an Rn value of 0.

Conversely, if Rn exceeds 1.0, this means that the observed average distance is greater than expected. A result of this nature implies that the points tend to be more regularly spaced

than in a random situation. Again, there are degrees of regularity, but the ultimate situation is one in which the points are spaced with perfect regularity. When this occurs, the points are arranged according to a lattice of equilateral triangles with each point equidistant from six other points. With this arrangement, Rn reaches its maximum value of 2.15.

Fig. 2.2 Types of distribution and Rn scale.



2.1.4 Limitations of the Nearest Neighbour Analysis:

1. The size of the area chosen is critical. Comparisons will be valid only if the selected areas are a similar size.
2. The area chosen should not be too large as this lowers the *Rn* value or too small.
3. Distortion will occur in valleys, where nearest neighbours may be separated by a river
4. Which settlements are to be included? Are hamlets acceptable?
5. There may be difficulty in working out the centre of the settlement for measurement purposes.

6. The boundary of an area is important. If the area is small or is an island there is little problem; but if the area is part of a larger region the boundaries must have been chosen arbitrarily.

7. In a case like this it is likely that the nearest neighbour of some points will be off the map.

2.3 GRAVITY POTENTIAL MODEL

2.3.1 Introduction

For decades, social scientists have been using a modified version of Isaac Newton's Law of Gravitation to predict movement of people, information, and commodities between cities and even continents. The model was proposed by Zipf to denote the spatial interaction between places within a transport system for a given period of time.

2.3.2 The concept of the theory

The gravity model, as social scientists refer to the modified law of gravitation, takes into account the population size of two places and their distance. Since larger places attract people, ideas, and commodities more than smaller places and places closer together have a greater attraction, the gravity model incorporates these two features.

The relative strength of a bond between two places is determined by multiplying the population of city A by the population of city B and then dividing the product by the distance between the two cities squared.

The formula to determine the relative strength of bond between two places (spatial interaction) is as follows:

$$I\,i\,j = Mi\ Mj / d\,ij$$

Where,

I i j is Spatial interaction between two places, i.e., i and j.

Mi is Mass of i^{th} place (Mass refers Population)

MJ is Mass of j^{th} place

dij is distance between two places, i.e., i and j.

Let us understand the spatial interaction of different cities with the capital city of Karnataka **(Fig.2.3)** with the following live example:

Calculate the strength of spatial interaction of different cities of Karnataka with the Bangalore, the capital of Karnataka. (The population of Bangalore is 5686)

SL.NO	CITIES(District HQ)	Distance from Bangalore in Km.	Total population in 000's	Iij(Spatial interaction)
1.	Belgaum	502	06	5731
2	Bellary	306	317	5890
3	Bidar	740	1745	1336
4	Bijapur	579	253	2484
5	Chamarajanagar	56	61	6193
6	Chitradurga	202	125	3518
7	Davanagere	267	364	7751
8	Gadag	479	155	1839
9	Gulburga	623	435	3970
10	Hassan	180	133	4065
11	Haveri	340	56	936
12	Karavar	547	75	779
13	Chikmagalore	251	101	2287
14	Dharvad	437	786	10226
15	Kolar	72	113	8923
16	Koppal	368	56	885
17	Madikeri	250	32	727

17	Madikeri	250	32	727
18	Mandya	100	131	7448
19	Mangalore	365	539	8396
20	Mysore	139	786	32152
21	Raichur	445	206	2632
22	Shimoga	274	274	5686
23	Tumkur	70	249	20225
24	Chikkaballapur	59	55	5300
25	Bagalkote	500	92	1046
26	Ramanagar	48	49	9358
27	Udupi	422	127	1711

2.3.3 Steps and calculation for determining Gravity potential:

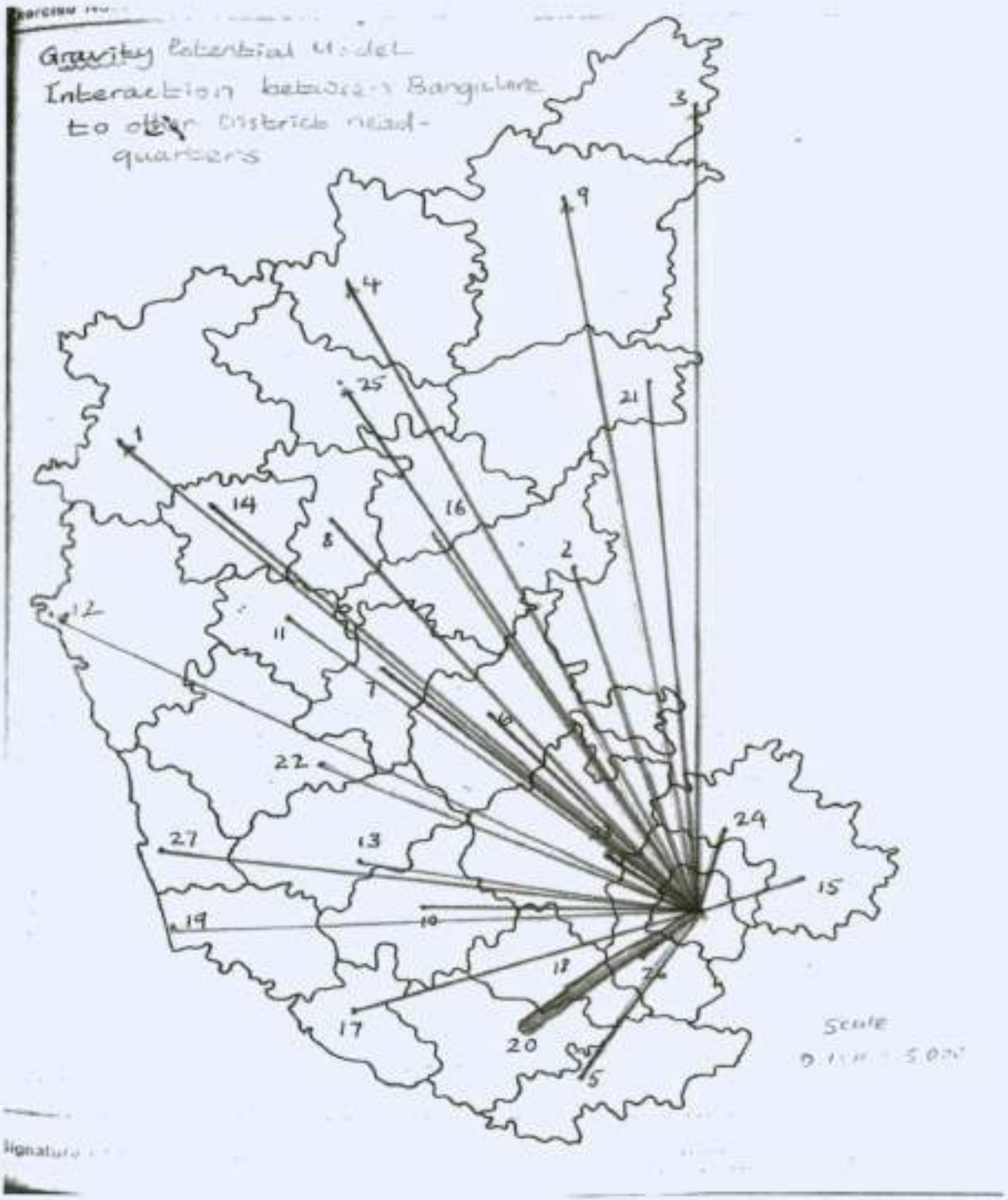
The formula to determine the strength of interaction between two places is

$$I\ i\ j = GMi\ Mj / d\ ij$$

1. As you have to find the interaction of different cities with the capital city, i.e., Bangalore, consider the population of Bangalore city as constant (GMi) here, the letter i refers Bangalore.
2. Multiply the population of Bangalore city (GMi) by the population of each of the cities (Mj).
3. Divide the product of multiplication by the distance between the Bangalore to each of the city(d ij)
4. Write down the values in the last column, which refers the amount of interaction of each city with the capital city.

5. Using these values, with appropriate scale, the strength of interaction of cities with capital can be represented cartographically on a map.

Fig. 2.3 Gravity Potential Model



2.3.4 Limitations:

1. The formula put forth by Zipf is very crude and it showed poor fit to real datasets for planning applications.
2. This model takes into account the interaction based on one activity, assuming all other parts of the system to be constant.
3. This is a static equilibrium model in that it simulates the situation at a point of time.
4. The model is based on the assumption of a closed region because all the interactions have to take place within the modified area.
5. This model lacks behavioural considerations and casual explanations

2.4 RANK SIZE RULE

2.4.1 Introduction:

The rank size rule was first observed by Auerbach in 1913 but was popularized by G.K.Zipf in 1949 in his book "Human behaviour and the principle of least effort". The basic aim of this theory is to find graphical description to the size distribution of cities which would apply to the situation prevailing in many countries.

2.4.2 Theoretical base and concept:

Rank size rule is a theory describing a numerical distribution of settlement, which recognises an empirical regularity whereby the product obtained by multiplying a city's rank by its size is equal to a constant, the population of the country's largest city such that for a given settlement system. According to this rule the population of a town is related with its rank. This implies an inverse relationship between the number of centres and the size of category. It means in a large country the number of urban centres is largest and goes on decreasing with increase in size level.

The formula to determine the relationship is as follows:

$$Pr = Pi/r$$

Where, Pr = expected population of r^{th} rank city

Pi = population of the largest city

r = rank of the city

Thus, the second ranking city of a country has one half of the population of the largest city, the third ranking city, one third of the largest and so on down the scale. In other words, if all cities in a country are arranged in order of decreasing population size, then the size relationship between the towns or cities of each rank is extremely regular with fewer larger cities/towns and many small cities/towns.

The relationship can be described in graphical form by plotting a city's rank against its population. If linear scales for the axes are used to show relationship then a curve results. If the logarithms (base 10) of population and rank are plotted on this graph a straight line will be produced. The formula can then be rewritten as:

$$\log pr = \log pi - \log r$$

This is useful for comparative purpose since by plotting a country's city size distribution on double logarithmic graph paper, the degree to which the distribution confirms to the rank size rule is visually expressed by the degree to which it deviates from a straight line.

Zippf suggests the two opposing forces of **diversification** and **unification** produce the regularity. **Diversification** creates a large number of small places each located near resources, minimising the transport costs of raw materials to the people in the process. **Unification** leads to the population being concentrated in few large places with the raw material being transported to the people. However, it is not clear how the conflict between these forces is resolved into the precise form of the rank size rule. Therefore, the rank size distribution of cities is the result of operation of a large number of forces over a long period of time so that once the rank size distribution has been obtained the operation of any one of these forces is only likely to produce a random and relatively minor deviation from the norm.

CITIES	Rank	population	
Bangalore	1	5686844	
Dharvad	2	786,018	
Mysore	3	785,800	
Mangalore	4	538,560	
Belgaum	5	506,235	
Gulburga	6	435,631	
Davanagere	7.	363,780	
Bellary	8	317,000	
Shimoga	9	274,105	
Bijapur	10	253,507	
Tumkur	11	248,592	
Raichur	12	205,634	
Bidar	13	173,678	
Mandya	14	131,211	
Chitradurga	15	125,060	
Hassan	16	113,331	
Kolar	17	113,299	
Udupi	18	112,706	
Chikmagalore	19	101,022	

2.5 LOCATION QUOTIENT

2.5.1 Introduction:

The spatial distribution of a particular feature or attribute is a result of multi-dimensional interactions of its determinants. As this process is dynamic and varies in space we observe concentration and dispersion in many of the spatial distributions.

The degree of concentration and dispersion of any phenomenon can be studied and measured in several ways. Among those the location quotient technique is more prominent.

2.5.2 The concept of Location quotient:

The location quotient refers to the ratio or the proportion of any characteristic in an area studied in relation to its proportion in the region. For example proportion of any aspect in the district to the proportion of the same characteristic in the region (state or country). This relative way of studying the proportions is important because a simple proportion of any characteristic like, proportion of urban population to the total population, proportion of workers in manufacturing or area under irrigation to the total cultivated area etc; of an area are related to the local area only. They do not tell us any thing about its position in the region or in the country. Thus, in a less urbanized region a pocket of 20% urban population may be considered as a higher concentration of urban population than its counterpart in a more urbanised region. Location quotient which gives us the relative picture of such proportions is defined as the ratio of the proportion of a particular characteristic in an area to the same proportion in the region.

Symbolically the location quotient can be expressed as

$$LQi = \frac{Pij/Pi}{Pj/P}$$

Where, Pij = Number of person in j^{th} category of area.

Pi = Total population in all the categories of area (in i area)

Pj = sum of the persons of category j in all the n areas. i.e. population of region under category.

LQI = Location Quotient

2.4.3 Interpretation of Location Quotient

Interpreting the Location Quotient is very simple. Only three general outcomes are possible when calculating location quotients. These outcomes are as follows:

LQ < 1.0	LQ = 1.0	LQ > 1.0

If the location quotient of an area is unity (1.0), the share of that category in the area and in the region is the same. The proportional share of the particular activity in the area would be more than or less than its value in the region, according to the value of location quotient being more than or less than unity.

If the location quotient of an area is less than one indicates the share of that category in the area is less than the expected share of the region.

A Location Quotient that is greater than zero suggests the share of that category in the area is greater than expected share of the region.

Let us now, understand the method of calculating Location Quotient (L.Q) with a live example for understanding the share of canal irrigation to the proportion of total irrigated area in Mandya district. (Fig. 2.5)

Calculate Location Quotient for determining the share of canal irrigation of each taluk of Mandya district using the proportion of area under canal irrigation to the total irrigated area.

Taluk	Total Irrigated area in ha.	Area under canal irrigation in ha.	% of area under canal Irrigation	LQ
K.R.Pet	26674	16140	60.28	0.86
Maddur	24387	18453	75.66	1.08
Malavalli	19099	14	77.44	1.10
Mandya	24645	18762	76.12	1.08
Nagamangala	9883	1834	18.60	0.26
Pandavapura	12926	10240	79.22	1.13
Srirangapattana	12631	11002	87.60	1.24
TOTAL	**130345**	**91208**	**69.98**	

Fig.2.5 Location Quotient

Location Quotient=	Regional area under canal irrigation in Year T (taluk)	/	Total regional area under irrigation in Year T (taluk)
	Total Regional area under canal irrigation in Year T (all the taluk in a district)		Total area under irrigation in all the taluk in Year T (all the taluk in a district)

2.5.4 Steps to calculate Location Quotient:

1. Find the sum of total Irrigated area and total area under canal irrigation for the district.
2. Find the percent of area under canal irrigation to the total irrigated area for each taluk and also for the whole district.
3. Use the formula of Location quotient $LQi = \frac{Pij / Pi}{Pj / P}$
4. To get the location quotient these Talukwise percentages have been divided by the same percentage in the district (region), and the resultant values have to be written against the respective taluks.
5. Once the location quotient is determined the same can be expressed cartographically through choropleth maps.

2.6 LET US SUM UP

1. The spatial analytical techniques are very useful in understanding the spatial pattern of the distribution of any phenomena, its strength of interactions with their neighbours, empirical regularity in size distribution and degree of concentration of phenomena.
2. Nearest-neighbour analysis provides the datum by enabling one to predict the average distance that would separate points from their nearest neighbours if the points were located at random throughout an area.
3. The relative strength of a bond between two places is determined by multiplying the population of city A by the population of city B and then dividing the product by the distance between the two cities squared. This technique is popularly called Gravity Potential Model in Geography
4. Rank size rule is a theory describing a numerical distribution of settlement, which

recognises an empirical regularity whereby the product obtained by multiplying a city's rank by its size is equal to a constant, the population of the country's largest city such that for a given settlement system.

5. The location quotient refers to the ratio or the proportion of any characteristic in an area studied in relation to its proportion in the region. This gives us the relative picture of such proportions is defined as the ratio of the proportion of a particular characteristic in an area to the same proportion in the region.

2.7 KEY WORDS

Nearest Neighbour Analysis: A technique for identifying settlement patterns (like uniform, random and clustered) on the basis of measurement of actual nearest neighbour distances between settlements.

Gravity Potential Model: A model proposed by Zipf to denote the strength of spatial interaction between places within a transport system for a given period of time.

Rank size rule: A theory is to find graphical description to the size distribution of cities which would apply to the situation prevailing in many countries.

Location Quotient: The location quotient refers to the ratio or the proportion of any characteristic in an area studied in relation to its proportion in the region. it is a technique used to measure the degree of concentration and dispersion of any phenomenon.

2.8 QUESTIONS FOR SELF STUDY

1. Use the Nearest Neighbour Analysis to describe the pattern of settlement in this area and comment on the Interpretation of the *Rn* statistic in significant figures. (Area = 3325 Km^2)

2. Calculate the strength of interaction with Place X in a region for other places and identify three places of maximum interaction. **(The population of X place is 3, 50,000)**

Settlement number	Nearest Neighbour	Distance km
1	2	13.0
2	3	9.0
3	2	9.0
4	2	9.5
5	8	9.0
6	7	12.5
7	6	12.5
8	5	9.5
9	8	12.5
10	11	4.0
11	10	4.0
12	11	8.5

3. Calculate the location quotient to represent the proportion of area under paddy cultivation to the total area under cereals in various talukas of Mysore district.

SL.NO	Talukas	Area under cereals in ha.	Area under paddy in ha.	
1	H.D Kote	24420	9368	
2	Hunsur	31367	12734	
3	K.R. Nagara	31844	26840	
4	Mysore	21932	5708	
5	Nanjanagud	35127	20801	
6	Periyapattana	36174	5505	
7	T. Narasipura	42340	33795	
	TOTAL	**223204**	**114751**	

2.9 FURTHER READING

P. J. Clark and F. C. Evans, "Distance to nearest neighbour as a measure of spatial relationships in populations", Ecology, vol. 35, 1954, pp. 445-53.

B. P. Birch, "The measurement of dispersed patterns of settlement", Tijdschrift voor Economische en Sociale Geografie, vol. *i8. 1067. pp. 68-78.

Aslam Mahmood, "Statistical methods in Geographical studies" Rajesh Publications New Delhi – 110002.

UNIT – 3: INTERPRETATION OF INDIAN DAILY WEATHER REPORTS – PART- SUMMER SEASON

Structure:

3.0 OBJECTIVES

After studying this unit, you will be able to

- Know the interpretations of weather reports are very important in understanding the weather characteristics of a region and also to predict the future weather conditions.
- Identify much of importance in various fields such as navigation, air transport, disaster management
- Understand the importance and uses of weather reports.
- Acquaint with the signs and symbols use in weather reports.
- Interpret the weather characteristics using some signs and symbols.

3.1 INTRODUCTION

A weather map is a symbolic representation of atmospheric conditions of an area at a given time. So, on a weather map weather phenomenon are shown using several symbols related to temperature, pressure, direction and velocity of wind, clouds, and amount of precipitation and other. All these weather phenomena are calculated numerically and different symbols have been provided for each weather element. These maps are also called **synoptic weather charts**.

3.2 IMPORTANCE AND USES OF WEATHER MAPS

It is well evident that weather affects the condition and way of life of people everywhere. Hence, to know about it in advance is of universal importance. Due to the developments in the field of meteorology we are in a better position to forecast weather conditions. Meteorological departments spread all over the world keep recording and exchanging with one another the data relating to weather through telecommunication networks. Artificial geostationary satellites orbiting our earth are also being used to measure and interpret weather phenomena (ex, INSAT). Specialised observatories also record elements like radiation, ozone atmospheric trace gases, Pollution and atmospheric electricity.

In India, meteorological observations are normally classified into five categories depending upon their instruments and the number of daily observations taken. The highest category is Class-I. Typical instrumental facility available in a Class-I observatory consists of the following:

- Maximum and minimum thermometers
- Anemometer and wind vane
- Dry and Wet bulb thermometer
- Rain gauge
- Barometer

Observations are taken in these observatories normally at 00,03,06,09,12,15,18,21 hours (Greenwich Mean Time) around the globe However, for logistic reasons, some of the observatories take limited number of daily observations upper air observation during daytime only.

The weather maps are **used** widely for the following reasons like

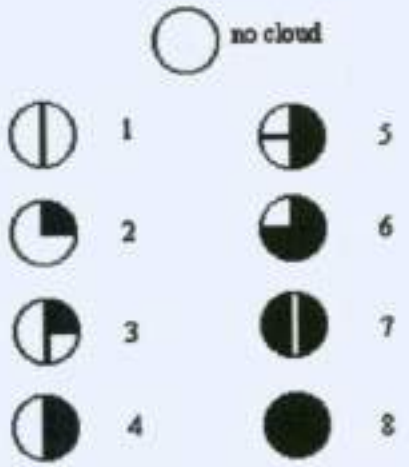
1. Weather maps are used in predicting weather conditions for a day, a week or a month in advance. These predictions can help to take precautionary measures against severe weather events.
2. Weather forecasts are also very useful for farmers, fishermen and crew of ships.
3. Prediction of atmospheric conditions a few hours ahead may facilitate air flights.
4. They help in locating and identifying different air masses, pressure systems, fronts and areas of precipitation.

3.3 WEATHER SYMBOLS

Weather maps cannot be properly understood without weather symbols. A detailed key of these symbols is generally given at the top right hand side of every weather map. These symbols provide information regarding wind direction and speed, rain fall, amount of cloud, other forms of precipitation, lighting, storms and sea conditions. In short, weather symbols help us to understand and to interpret weather maps.

3.3.1 Cloud cover is recorded on weather charts by shading in parts of the circle. If there are no clouds, the circle is left white and if the sky is completely covered in cloud, the circle is filled in. The sky is divided into eighths; if half of the sky is covered in cloud, then 4 eighths would be recorded on the weather chart.

Fig - 3. 1 Cloud cover (in eighths of sky)



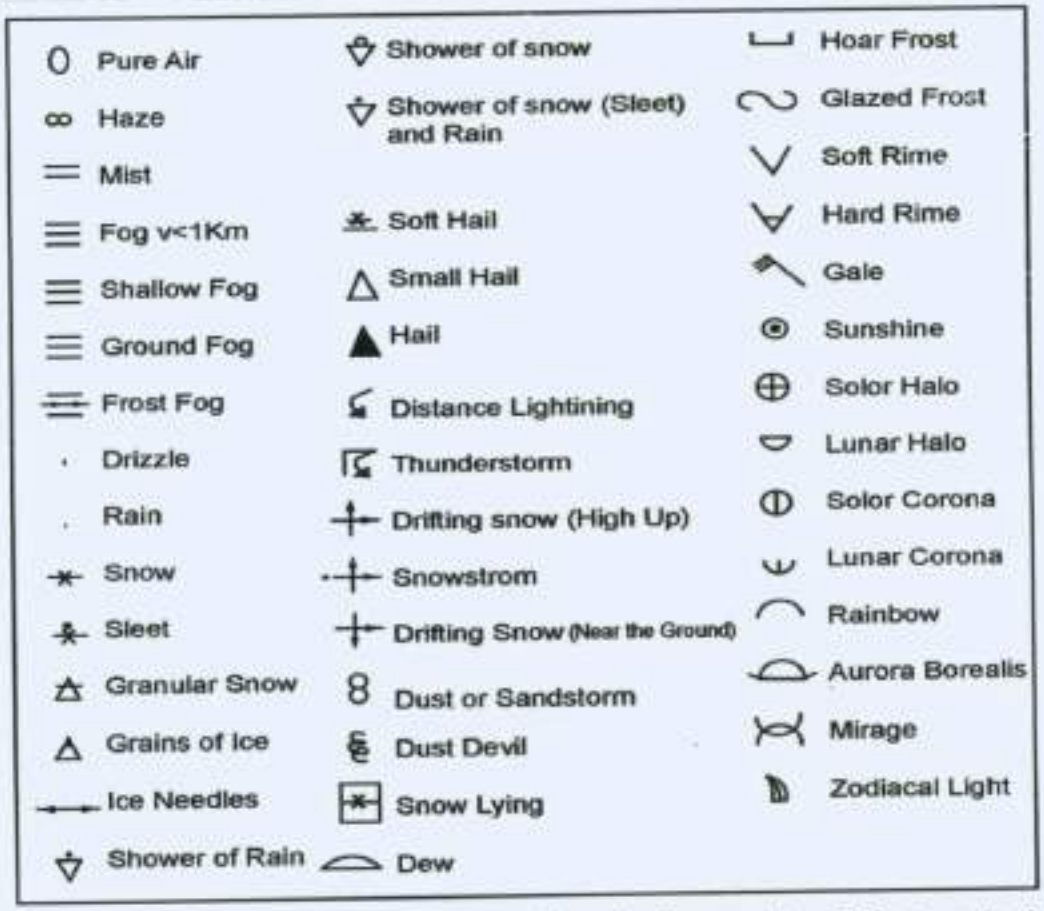


Fig 3.2 ***Meteorological Symbols (Approved by the International Meteorological Organisation, Warsaw, 1935)***

Beaufort No.	Wind	Arrow	Speed km/hr	Common effects
0	Calm		0	Calm, Smoke rise vertically.
1	Light air		1-5	Direction of wind shown by smoke drift, but not wind vanes.
2	Light breeze		6-11	Wind felt on face; leaves rustle; ordinary vane move by winds.
3	Gentle breeze		12-19	Leaves and small twigs in constant motion, wind extends light flag.
4	Moderate breeze		20-28	Raises dust and loose papers, small branches are moved.
5	Fresh breeze		29-38	Small tree in leaf begin to sway, crested wavelets from an inland waters.
6	Strong breeze		39-49	Large branches in motion; whistling heard in telegraph wires umbrellas used with diffiucty.
7	Moderate gale		50-61	Whole tree in motion, inconvenience felt when walking against wind.
8	Fresh gale		62-74	Breaks twigs off trees; generally impedes progress.
9	Strong gale		75-88	Slight structural damage occurs (chimney pots and slates removed.)
10	Whole gale		89-102	Seldom experienced inland; trees uprooted, considerable structural damage occurs.
11	Storm		103-117	Very rarely experienced, accompanied by widespread damage.
12	Hurricane		118 plus	Most destructive.

Fig 3.3 Wind speed and common effect.

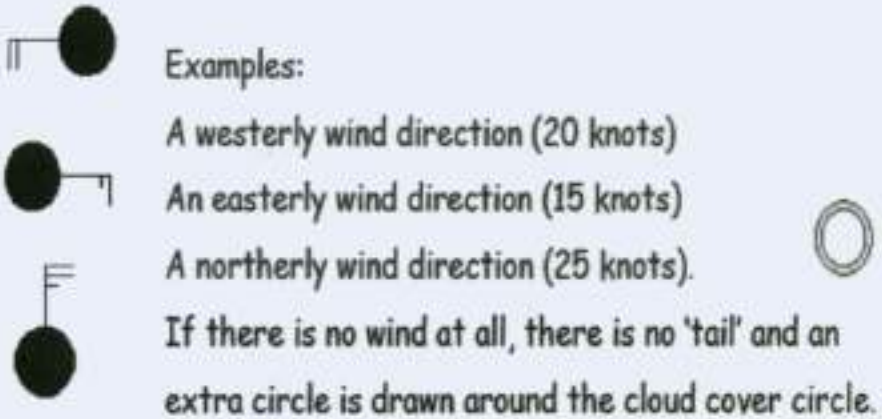
3.3.2 Air pressure is recorded on the weather chart with the help of Isobars. Air pressure is normally in the range of 950 – 1050 millibars.

Current weather symbols are as follows:

Fig. 3.4 current weather symbols

3.3.3 Wind speed and wind direction are recorded by the addition of a 'tail' to the circle. The direction of the wind is marked in the compass position from which the wind is coming from. The speed of the wind is noted by the addition of small lines to the 'tail'. Each full line equals 10 knots; a smaller half line is 5 knots.

Fig.3.5 Wind direction and velocity



3.4 INTERPRETATION

A Weather map is generally interpreted under the following heads.

- General information
- Atmospheric pressure
- Wind
- Sky conditions
- Precipitation
- Sea condition

General information: This includes day, date and time and the area to which the weather conditions are related. This information is printed on the top of each weather map. It also includes the scale of the map and important symbols used in showing various weather conditions.

Pressure conditions: Pressure condition includes the interpretation of isobaric systems represented by the isobars. It is also includes the studying of pressure gradient.

Wind: the wind system includes the direction and velocity of winds in relation to the distribution and spacing of isobars.

Sky conditions: this includes the nature and amount of cloud cover and other atmospheric phenomena such as haze, lightning, mist, fog and dust storms.

Precipitation: under this heading general distribution of precipitation and special areas of heavy and scanty precipitation are studied.

Sea condition: conditions of the sea are described as rough, smooth and calm.

3.4.1 General Information:

The map shows the weather conditions of India and its neighbouring countries observed on Monday, 7 May, 1990 at 0830 hrs. I.S.T. The season prevailing in Indian subcontinent during this period is the summer.

3.4.2 Pressure conditions:

If you look at the isobars in the weather map you will notice a low pressure centre towards the south eastern part of India on the Bay of Bengal .This low pressure centre is focussed near Chennai city. As the isobars are arranged as concentric circles or ellipses with

decreasing pressure towards centre in the region they indicate it is heading towards deep depression or a cyclone. The dia metre of this cyclone is approximately extends about 1500 Km. The direction of the wind in the depression is clock-wise as the region lies in the southern hemisphere.

In the north western part of India, near the border between Rajasthan and Gujarat states, a trough of low pressure can also be found. The North-eastern states of India have maximum atmospheric pressure of 1012mb. This reveals the temperature is more on oceans and sea especially on Bay of Bengal associated with rising air. On the other hand the temperature is relatively less on North-Eastern part with high pressure associated with descending air. The pressure gradient in north India is gentle in contrast to the eastern coast **of India.**

3.4.3 Wind System

The general direction of the wind is northerly on the land body and south westerly on the water body with the local variations due to the differences in pressure and temperature. This is well evident in the eastern coast of Tamilnadu and Andhra Pradesh where the winds are north westerly in direction. Further in the north eastern coastal region the wind direction is south-easterly.

3.4.4 Wind velocity

The wind velocity is ranging between 5 knots to 35 knots with slight regional variation. On the south eastern coastal area and on the Bay of Bengal the wind velocity seems greater compared to north and central parts of India. The wind velocity in east coastal region ranges between 15 knots to 35 knots (1 Knot = 1.852 Km) per hour. The other regions experience light breeze.

3.5 SKY CONDITIONS

These refer to the cloud cover, nature of clouds and other atmospheric phenomena.

3.5.1 Cloud cover:

The sky is almost clear except in south eastern states of India, particularly in the Koramandal coast due to rising air currents and the depression of atmospheric pressure.. There are some exceptions near Himachal Pradesh and Punjab where the sky is having7/8 amount of clouds but not overcast like south eastern India. In the rest of the place the sky is relatively free from thick clouds.

3.5.2 Other atmospheric phenomena

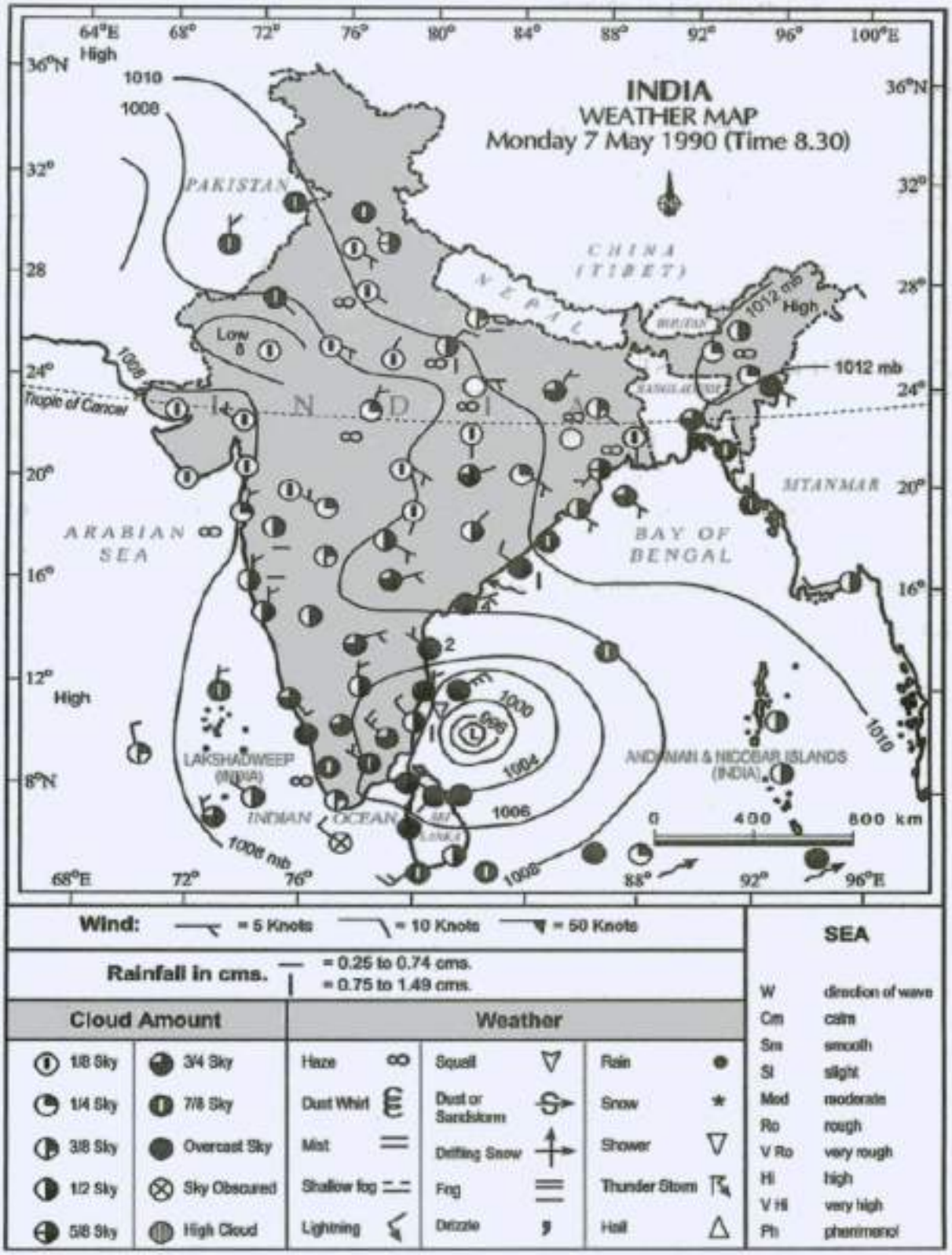
The eastern coastal region has received a small amount of rain between 1 to 2 Cm and in the western coastal tract haze is reported around the Malabar Coast of Kerala. In the rest of the country the dry conditions are prevailing.

3.6 SEA CONDITION

The sea condition is rough around Chennai in south eastern coast of India where as the rest of the ocean body seems to be calm and smooth.

3.7 WEATHER FORECAST

It is expected that the rain and haze is likely to occur and continue to rain in east coast of India, especially around Chennai. In the east coast, as the winds are predominantly blowing in south easterly direction, the rain is likely to move away towards north east. The thick and heavy clouds are likely to remain in east coastal region. In another 12 to 18 hours a deep depression or cyclone may hit the east coast. The weather remain dry in other parts of the country.


INDIA
WEATHER MAP
Monday 7 May 1990 (Time 8.30)
64°E 68° 72° 76° 80° 84° 88° 92° 96° 100°E
36°N
32°
28
24°
20°
16°
12°
8°N
High
1010
1008
PAKISTAN
CHINA (TIBET)
NEPAL
BHUTAN
1012 mb
High
Low
1008
Tropic of Cancer
1012 mb
MYANMAR
ARABIAN SEA
BAY OF BENGAL
High
1000
1004
1006
1008 mb
1010
LAKSHADWEEP (INDIA)
ANDAMAN & NICOBAR ISLANDS (INDIA)
INDIAN OCEAN
SRI LANKA
0 400 800 km
68°E 72° 76° 88° 92° 96°E
Wind: = 5 Knots = 10 Knots = 50 Knots
Rainfall in cms. = 0.25 to 0.74 cms. = 0.75 to 1.49 cms.
Cloud Amount
1/8 Sky
1/4 Sky
3/8 Sky
1/2 Sky
5/8 Sky
3/4 Sky
7/8 Sky
Overcast Sky
Sky Obscured
High Cloud
Weather
Haze
Dust Whirl
Mist
Shallow fog
Lightning
Squall
Dust or Sandstorm
Drifting Snow
Fog
Drizzle
Rain
Snow
Shower
Thunder Storm
Hail
SEA
W direction of wave
Cm calm
Sm smooth
Sl slight
Mod moderate
Ro rough
V Ro very rough
Hi high
V Hi very high
Ph phenimenol

3.8 LET US SUM UP

- A weather map is a symbolic representation of atmospheric conditions of an area at a given time.
- **Weather maps are used in predicting weather conditions for a day, a week or a month in advance. These predictions can help to take precautionary measures against severe weather events.**
- The weather symbols provide information regarding wind direction and speed, rain fall, amount of cloud, other forms of precipitation, lighting, storms and sea conditions. In short, weather symbols help us to understand and to interpret weather maps.
- A Weather map is generally interpreted under the following heads.

  General information

  Atmospheric pressure

  Wind

  Sky conditions

  Precipitation

  Sea condition

  Weather forecast

3.9 KEY WORDS

- **Weather map:** A weather map is a symbolic representation of atmospheric conditions of an area at a given time. It is also called as Synoptic weather charts.
- **Isobars:** the lines drawn on the map connecting places of equal amount of the distribution of atmospheric pressure.
- **Atmospheric depression:** it is a Low pressure centre with the lowest value at the centre and it is surrounded by isobars with steep pressure gradient.

3.10 QUESTIONS FOR SELF STUDY

1. Discuss the importance and uses of weather maps.
2. Explain how the meteorological data in india is gathered and the process of weather forecast are made.
3. With the help of a weather chart of early summer season attempt to interpret the distribution of atmospheric pressure and wind, cloud conditions.

3.11 FURTHER READING

1. Elements of practical Geography (1990) R.L.Singh
2. Fundamentals of Cartography (2000) – A.Ramesh and Misra.R.P

UNIT - 4: INTERPRETATION OF INDIAN DAILY WEATHER REPORTS –PART II - WINTER SEASON

Structure:

4.0 OBJECTIVES

After studying this unit, you will be able to

- Find the differences in weather phenomena with the map interpreted earlier.
- Understand the pressure distribution over land and water bodies.
- Examine the amount and distribution of clouds.
- Understand the wind direction and velocity.

4.1 INTRODUCTION

We learnt the method of interpreting the weather chart of summer season in the previous unit. In this unit let us understand the methods of interpretation for winter season. Basically the methods and techniques of interpretation are not going to change for different seasons. However, the prior knowledge of the weather characteristics of the season will help the interpreter to analyse the weather phenomena more accurate than the one who does not have prior knowledge of it.

The months of January and February represent the cold weather season of India. In the Northern plains of India the cool north westerly and westerly winds set in driving away the patches of stratocumulus clouds from the sky and heralding clear and fine weather with pure air and blue sky. The days are warm and sunny and the nights are cold. Sometimes due to the passage of western disturbances through northern India the serenity of the weather is disturbed and some rain fall occurs in northern India.

4.2 GENERAL INFORMATION

The weather map shows the weather conditions observed on Wednesday 2nd January 1991 at 08-30 hrs I.S.T. The season is characterised with winter.

4.3 PRESSURE CONDITION

If you observe the map you will notice two high pressure areas outside the Indian territory both towards north- west (Pakistan) and north-east of India (Myanmar). The oceans and sea towards south of Indian main land experiences Low pressure while the land body in north have high pressure.

4.3.1 Areas of high pressure: the high pressure areas are formed both in north western and north eastern regions of India caused due to the low temperature causing the winds to descend in these regions. The maximum barometric pressure lies away from the north western part of India situated in Pakistan with a 1024 mb. Towards eastern states of India the pressure is relatively less with 1018 mb.

4.3.2 Areas of low pressure: The low pressure area lies on the south of Indian main land, between Sri Lanka and Andaman Nicobar islands with the pressure of 1010 mb.

4.3.3 Pressure gradient: As the isobars are regularly spaced over the water and irregular on land indicates the gentle pressure distribution over sea and steep on land except in North West and north eastern India. The steep gradient runs from North West direction towards south east covering the states like Gujarat, Rajasthan, Madhya Pradesh, and Maharashtra, eastern coastal regions of Orissa, Tamilnadu and Andhra Pradesh.

4.4 WIND

4.4.1 Wind direction: The general wind direction in winter season is from North –north west to south and south east. The wind is continental in nature blowing from land to oceans and sea from north to south. There are certain deviations to the general wind direction due to variations in local conditions. As this season is winter, usually the winds are blowing from northern india.

4.4.2 Wind velocity: The season is characterised with calm and regular wind velocity. The wind velocity in the region is ranging between 10 to 20 knots. The interior districts of south Indian states have calm and regular wind speed. The velocity is more on ocean and sea bodies in contrast it is much slower on the land.

4.5 SKY CONDITION

This refers to cloud cover, nature of clouds cover and other atmospheric phenomena.

4.5.1 Cloud cover: the cloud cover is maximum or it is overcast in parts of Calcutta and in several parts of north eastern states. The south India is relatively experiencing more clouds which is ranging from ¼ cloud to 7/8 sky cover by clouds during this season. The entire east coast of India is experiencing the cloudy condition. However, the interior lands in the north and central parts of India are free from clouds and hence the sky is very clear in there.

4.5.2 Other atmospheric phenomena: The entire east coast of India has received the rain. The rain has shown an increasing trend towards north in the east coast which is relatively less in the south and higher at north.

4.6 PRECIPITATION

The haze is found in interior parts of Kerala, Tamilnadu and northern Karnataka. The mist is occurred at parts of northern Madhya Pradesh, Uttar Pradesh and fog has distributed mostly in north-eastern states. The haze is found distributed throughout the nation at this time.

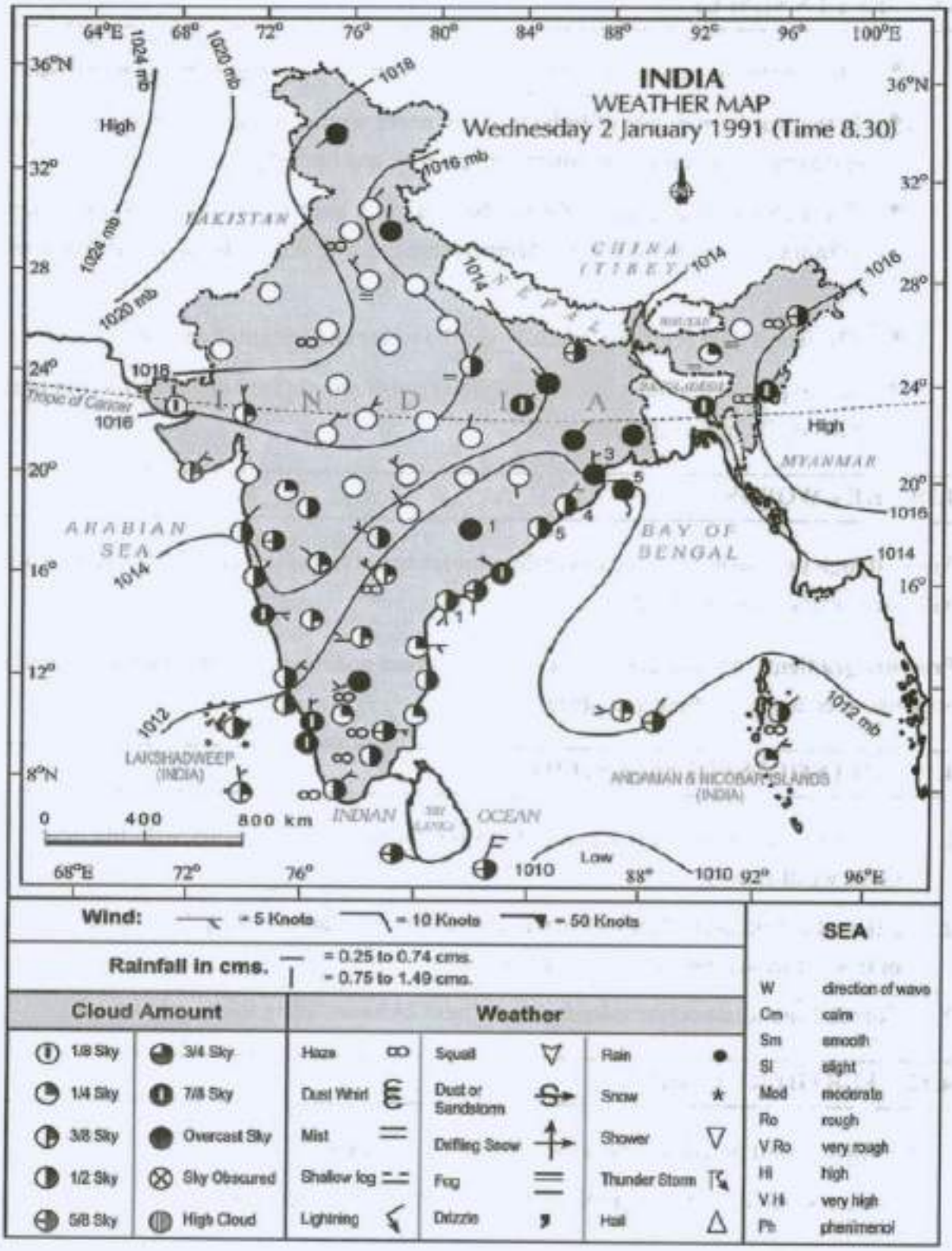
4.7 SEA CONDITION

As the winds are blowing from high pressure areas in north on land towards low pressure area over sea, the condition of the sea is calm and smooth around the Indian sub-continent.

4.8 WEATHER FORECAST

it is expected that the clear and bright sky will remain in the coming days in most parts of the Indian subcontinent. There are no possibilities of Rain in near future as the moisture in the air is quite less and dry. Hence the dry spell is expected to prevail in majority of places. The conditions of fog, mist and haze may occur in certain parts of India. The sea condition is also expected to remain calm and smooth in the days to come.

Fig.4.1 Weather map – Winter season



4.9 LET US SUM UP

- The months of January and February represent the cold weather season of India.
- In the Northern plains of India the cool north westerly and westerly winds set in heralding clear and fine weather with pure air and blue sky.
- The high pressure areas are formed both in north western and north eastern regions of India caused due to the low temperature causing the winds to descend in these regions.
- The isobars are regularly spaced over the water and irregular on land.
- It is expected that the clear and bright sky will remain in the coming days in most parts of the Indian subcontinent.

4.10 KEY WORDS

Areas of high pressure: the areas where the atmospheric pressure is more which is represented with the isobars of greater value.

Pressure gradient: the difference between the maximum and minimum amount of atmospheric pressure over a specific time and place.

4.11 QUESTIONS FOR SELF STUDY

1. Compare the pressure distribution between the sea and land body with the help of a given weather map.
2. Attempt to find the differences in wind direction and velocity using the weather maps of both summer season and winter season.
3. Forecast the weather phenomena for the next 24 hours using the weather map.

4.12 FURTHER READING

Elements of practical Geography (1990)- R.L.Singh

Fundamentals of Cartography (2000) – A.Ramesh and Misra.R.P

ಕರ್ನಾಟಕ ರಾಜ್ಯ ಮುಕ್ತ ವಿಶ್ವವಿದ್ಯಾನಿಲಯ

ಮಾನಸ ಗಂಗೋತ್ರಿ ಮೈಸೂರು – 570 006

ಉನ್ನತ ಶಿಕ್ಷಣದ ಅವಕಾಶಗಳನ್ನು ವೃದ್ಧಿಸಿ ಶಿಕ್ಷಣವನ್ನು ಪ್ರಜಾತಾಂತ್ರಿಕರಿಸುವ ಸಾಧನವಾಗಿ ಮುಕ್ತ ವಿಶ್ವವಿದ್ಯಾನಿಲಯ ವ್ಯವಸ್ಥೆಯನ್ನು ಅನಾವರಣಗೊಳಿಸಲಾಗಿದೆ.

ರಾಷ್ಟ್ರೀಯ ಶಿಕ್ಷಣ ನೀತಿ ೧೯೮೬

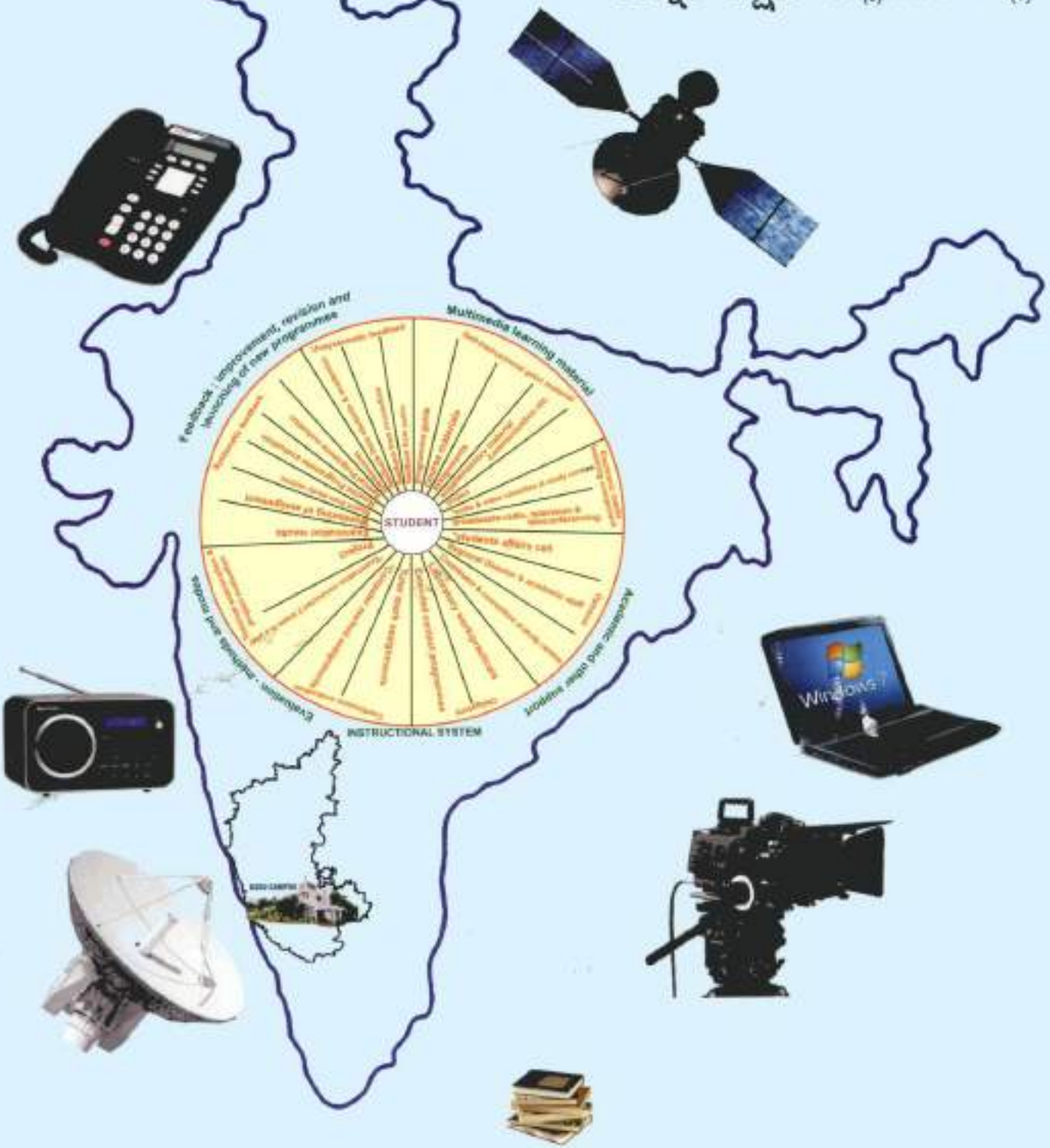
♣ ಪ್ರಾದೇಶಿಕ ಕೇಂದ್ರಗಳು

ಬೆಂಗಳೂರು
ದಾವಣಗೆರೆ
ಗುಲ್ಬರ್ಗಾ
ಧಾರವಾಡ
ಶಿವಮೊಗ್ಗ
ಮಂಗಳೂರು
ತುಮಕೂರು
ಹಾಸನ
ಚಾಮರಾಜನಗರ
ಬಳ್ಳಾರಿ
ಮಂಡ್ಯ
ಕೋಲಾರ
ಬಿಜಾಪುರ
ಬೆಳಗಾಂ
ರಾಮನಗರ
ಬೆಂಗಳೂರು (ಮತ್ತೊಂದು)
ಚಿಕ್ಕಮಗಳೂರು
ಉಡುಪಿ
ಕಾರವಾರ
ಬೀದರ್
ಮೈಸೂರು

● ಮುಖ್ಯಕಚೇರಿಗಳು
★ ಒಟ್ಟು ಅಧ್ಯಯನ ಕೇಂದ್ರಗಳು: ೧೨೬
♣ ಪ್ರಾದೇಶಿಕ ಕೇಂದ್ರಗಳು: ೨೧
⊕ ಬಿ ಎಡ್ ಅಧ್ಯಯನ ಕೇಂದ್ರಗಳು: ೧೧
+ ಎಂ ಎಡ್ ಅಧ್ಯಯನ ಕೇಂದ್ರಗಳು: ೦೬

KSOU

Higher Education to everyone everywhere
ಉನ್ನತ ಶಿಕ್ಷಣ ಎಲ್ಲರಿಗೂ ಎಲ್ಲೆಡೆ



ಕರ್ನಾಟಕ ರಾಜ್ಯ ಮುಕ್ತ ವಿಶ್ವವಿದ್ಯಾನಿಲಯ
ಮಾನಸಗಂಗೋತ್ರಿ, ಮೈಸೂರು - 570 006
Karnataka State Open University
Manasagangotri, Mysore - 570 006 Website : www.ksoumysore.edu.in