



Name: Prasanna

Subject: Answering

Time: -----

Maximum Marks: 180

		TO BE FILLED BY EVALUATOR
Question No:	Marks allotted	Comments
Q: 1	<u>32</u>	Need to improve
Q: 2	<u>38</u>	
Q: 3	<u>27</u>	
Q: 4		
Q: 5		
Q: 6		→ put heading/sub-heading with clarity
Q: 7		
Q: 8		
Q: 9		
Q: 10		
Q: 11		→ when you are making short cut writing (chart), you need to clarity with writing
Q: 12		
Q: 13		
Q: 14		
Q: 15		
Q: 16		→ Try to write in paragraphic format rather than bullet points
Q: 17		
Q: 18		
Q: 19		
Q: 20		

Total Marks (Obtained): 97/180

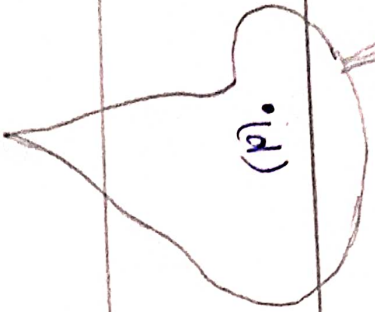
Feedback/Comment/Suggestion:

can be improved !!!

Handwriting → good
Context → good
Content → enough
Presentation → can be improved

→ Focus on each part of the question
→ Try to better map/diagram

Apparition
mt Range



Write the name beside the marking

Try to do it with different printers

⊖, ⊕, ⊙ → for exact place

near - → for direction

mt → m m region → { }

marking location most significant

1.

(a) South China Sea:

The South China Sea is a marginal sea of the western Pacific Ocean. It is bounded in the north by the shores of south China. The South China Sea is a region of tremendous economic and geostrategic importance. One-third of the world's maritime shipping passes through it. Write Again

(b) Appalachian mountain range:

The Appalachian mountains, often called the Appalachians, are a system of mountains in eastern to northeastern North America. The Appalachian chain is a barrier to east-west travel, as it forms a series of alternating ridgelines and valleys. AS per Demand

(c) Pittsburgh:

Pittsburgh is a city in the state of Pennsylvania in the United States. Pittsburgh is known both as "the steel city" for its more than 300 steel-related businesses and as the "city of Bridges" for its 446 bridges. Aside from steel, Pittsburgh has led in the manufacturing of other important materials like aluminium and glass and in the petroleum industry. Write Again

(d) La Paz:

La Paz is the capital of Bolivia. La Paz is the highest capital city in the world. Due to its altitude, La Paz has an unusual subtropical highland climate, with rainy summers and dry winters.

(e) River Nile:

The Nile is a major north-flowing river in northeastern Africa. It flows into the Mediterranean Sea. The longest river in Africa. The Nile is an important economic river, supporting agriculture and fishing.

(f) Horn of Africa:

The Horn of Africa is the easternmost peninsula of the African continent. It lies along the southern boundary of the Red Sea. The Horn of Africa consists of the Djibouti, Eritrea, Ethiopia and Somalia.

(h) Gulf of Aden:

Gulf of Aden, deepwater basin that forms a natural sea link between the Red Sea and the Arabian Sea. The gulf is situated between the coasts of Arabia and the Horn of Africa.

(i) Hwang Ho:

Hwang Ho is also called Yellow River. It is the country's second largest river. Its basin was the birthplace of ancient Chinese civilization.

(k) Palghat

It is a mountain pass in the western Ghats between Tamil Nadu and Kerala. The pass is located between the Nilgiri Hills to the north and Anaimalai Hills to the south.

(l) Deccan Plateau:

The Deccan plateau is the largest plateau

Date _____
Page _____

in southern India between the western Ghats and Eastern Ghats. The northern extremity is the Vindhya range. This land is the oldest and most stable in India. The Deccan Plateau consists of dry tropical forests that experience only seasonal rainfall.

(2) Discuss the cause and factors associated with the origin and weather characteristics of the tropical cyclones. Differentiate between Tropical and Extra-tropical climate.

Cyclones developed in the regions lying between the tropics of capricorn and cancer are called tropical cyclones which are not regular and uniform like extratropical or temperate cyclone. There are numerous forms of these cyclones which vary considerably in shape, size, velocity, and weather conditions.

- It develop 5'-20' latitude
- Closed air circulation - result of rapid upward movement of hot air - subjected coriolis force.

Features:

1. Size varies: diameter varies between 80 km and 300 km
2. Varying velocities weak cyclone - 32 km/hr
Strong cyclone - 180 km/hr
3. Over oceans - more vigorous
- more with high velocities
Over land - Weak and feeble
- Dies out - interior portion of continent

Therefore, cyclone affects - predominantly coastal areas

4. Centre of cyclone - Extremely low pressure
(Responsible for wind speed)
5. Cyclonic wind movement
N. Hemisphere - Anticlockwise
S. Hemisphere - Clockwise
6. Each part of tropical cyclone yields rainfall
7. Not always mobile sometimes, stationary over a particular place for several days and yields rainfall causing flood and environmental disaster
8. Usual movement - East to west (under influence of trade winds)
9. Weakens - when enters subtropical region.
10. Frequency and affected area far less than temperate cyclone.

D

Favourable conditions for tropical cyclone formation

1. There should be continuous supply of abundant warm and moist air.
2. Higher value of Coriolis force is required for the origin of these cyclones.

Coriolis force (f):

- Zero at equator - No cyclone at equator
- f increase with latitude
- f at 5° latitude - significant enough to create storm (cyclonic vortex)
- $\sim 65\%$ of cyclonic activity between 10° to 20° latitude

2. ~~Good source of latent heat~~

Ocean water is good source of moisture because the temperature of ocean water is $\geq 27^\circ\text{C}$. It feeds moisture to the storm.

- Condensation of moisture - release enough latent heat of condensation - to drive storm

3. ~~Low level Disturbances:~~

- Small local differences - water temperature and air temperature
- Produce many low pressure centres of small size
- Therefore, weak cyclonic circulation develops around these centres.
- When small cyclone come together a true cyclonic vortex may develop

5. Temperature contrast between air mass

Trade winds (from both hemisphere) - meet along intertropical front



Convergence of these air masses (different temperature)
Pre-existing instability

} Prerequisite - Origin and growth of wide tropical storms

6. ~~Upper air Disturbance:~~

Remains of upper troposphere cyclones } moves -
are remnants of temperate cyclones } tropical latitudinal region

Thunderstorm development ← occurrence of rising

7. Wind shear:

- Wind shear - difference between wind speed at different heights.

8. Upper Troposphere divergence:

- Well developed - upper layer divergence necessary
- From low region - rising air current
- Pumped out - for maintaining the centre

9.

9. High Humidity factor

- High humidity ($\sim 50\% - 60\%$) required in mid troposphere
- There must be presence of moist air due to the presence of moist air formation of cumulonimbus clouds occur.
- Such conditions exist over equatorial doldrums

↳

Great moisture carrying capacity because trade wind continuously replace the saturated air

Origin and development of Tropical cyclone:

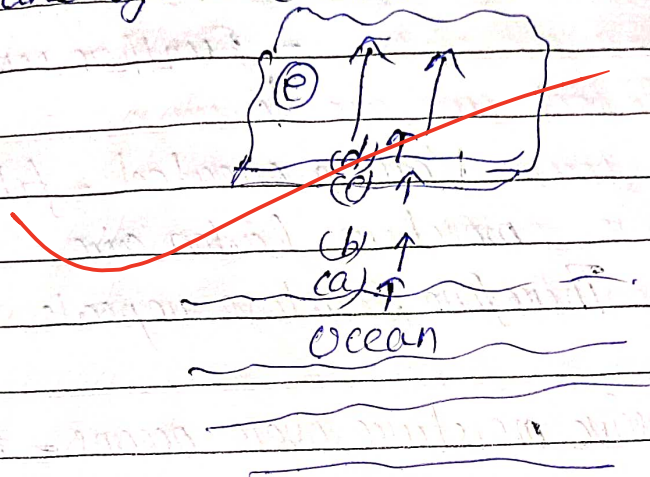
- It is thermal origin
- Develop over tropical seas - late summer (August to mid-November)
- At these location - strong local conventional currents acquire a whirling motion (because of Coriolis force)

There are three stages:

- (1) Origin
- (2) Early
- (3) Mature

1. Origin

- Under favourable conditions, multiple thunderstorms originate over oceans
- These thunderstorms merge and create - intense low pressure system (Wind is warm and lighter)



- (a) Warm moist air moves over ocean
- (b) Water vapour rises into the atmosphere
- (c) As water vapour rises - cools and condenses into liquid droplets
- (d) Condensation releases heat into the atmosphere - making air lighter
- (e) Warmed air continues to rise - with moist air from the ocean taking its place - creating more wind

2. Early stage:

- In thunderstorm, air - uplifted (when warm and light)
- Due to lapse rate and adiabatic lapse rate (at certain height)

The temperature of air falls
Moisture of air undergoes condensation

↓ release
Latent heat of
condensation

↓
Air - more warmer
- much lighter
- Further uplifted

↓
Vacuum created - filled by fresh
moisture laden air
Therefore; cyclone repeats

- Due to excessive moisture over oceans - thunderstorms
intensifies

↓
air sucked in - much faster
rate

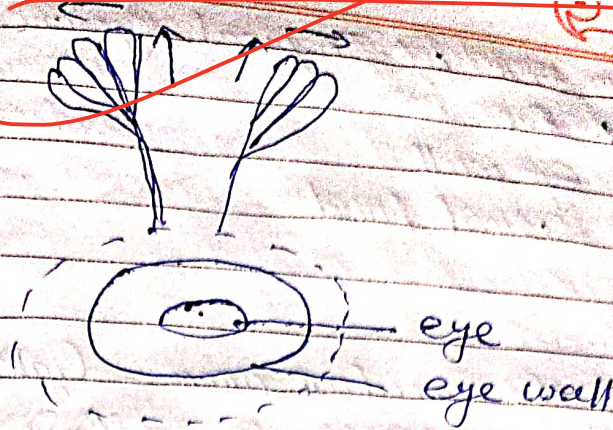
↓
Air from surrounding - rushes in + undergoes
deflection (due to Coriolis
force)

↓
Creates vortex (spiralling air
column)

Due to centripetal acceleration

↓
Air in vortex - forced to form a
Regions of calmness (called eye) at the
centre of cyclone.

make the
diagram with
pencil



better
diagram.

- The inner surface of vortex forms eye wall
(most violent region of cyclone)

- All winds - carried upward



loses moisture



Becomes cold and dense



Descends to surface

On reaching land - moisture supply cut off

- storm dissipates

- If ocean supply more moisture - storm reaches mature stage

Mature stage:

- This stage, spirally winds creates multiple convective cells - with successive calm and violent regions
- Regions with cumulonimbus clouds formation as rain bands.
- Cloud formation - dense at centre
cloud size decrease - from centre to periphery

Structure of Tropical cyclone:

1. Eye
2. Eye wall
3. Spiral band

1. Eye:

- Roughly circular area - light winds
- fair weather
- Lies at the centre of severe tropical cyclone
- Little or no precipitation
- Region of lowest surface pressure
- Size ranges from: 8 km - 200 km
most are 30 - 60 km in diameter
- Eye - warm temperature - due to compressional warming of subsidised air

2. Eye wall:

- Eye surrounded by eye wall
- Roughly circular ring of deep
- Area of fastest surface wind
- In eye wall - air flows upward

3. Spiral band:

- Long, narrow rain bands
- With low level convergence
- Upper level divergence

Tropical

(i) It formed between 5-30° latitude

(i) Tropical cyclone moves from east to west

(ii) A tropical cyclone has an effect on a comparatively smaller area than a temperate cyclone

(iv) The velocity of wind in a tropical cyclone is much higher and it is more damaging.

(v) Tropical cyclone forms only on seas with temperature more than $26-27^{\circ}\text{C}$ and dissipate on reaching the land.

(vi) A tropical cyclone doesn't last for more than 7 days.

(vii) Highest rainfall is in eyewall

(viii) They derive their energy from latent heat of condensation

Temperate

(i) It forms between 35 to 65 latitudes

(ii) Temperate cyclone moves from west to east

(iii) Temperate cyclone affects a much larger area

(iv) The velocity of air is comparatively lower

(v) Temperate cyclone can be formed on both land and sea

(vi) Temperate cyclone can last for a duration of 15 to 20 days.

(vii) Rainfall is along the fronts. Highest rainfall along the cold fronts.

(viii) They derive their energy from thermal contrast which is found across front between two air masses

(ix) Maximum activity is surrounding centre

(ix) Active allwhere and maximum activity is at centre.

(x) It is thermal origin

(x) It is dynamic origin

3. Discuss the origin, weather characteristics and impacts of Indian Monsoon. Elaborate the recent techniques of its prediction.

Monsoon:

Monsoon derived from arabic word "Mausim" which means season.

60 marks

- It is a seasonal winds
- Reverse direction of monsoon changes in season.
- Monsoon has double system of seasonal winds

Summer: Sea $\rightarrow$ Land (SW monsoon)

Winter: Land $\rightarrow$ Sea (NE monsoon)

- South west monsoon - intense low pressure over Tibetan plateau

* North east monsoon - High pressure cells over Tibetan and Siberian Plateau

- South west monsoon - intense rainfall in most India
- North east monsoon - rainfall in Tamil Nadu coast

Factors south west monsoon formation:

1. Intense heating of Tibetan Plateau during summer
2. Permanent high pressure cell over south Indian ocean.

Factors - onset of south west monsoon:

1. Subtropical jet stream
2. Tropical Easterly jet
3. ITCZ

Factors - intensity of south west monsoon:

1. Somali Jet
2. Somali current
3. Indian ocean branch of Walker cell
4. Indian ocean dipole

Factors - North east monsoon formation:

1. Formation + Strengthening - High pressure cell over Tibetan plateau and Siberian plateau during winter
2. ITCZ migration towards south

Mechanism of Indian Monsoon:

- Origin of monsoon not fully understood. But there are several theories. i.e

Early theory

Modern theory - Static concept

Classical theory - Thermal concept

Modern theory - Dynamic concept

Early theory:

→ Monsoon was mentioned in scriptures like Rigveda but its mechanism not mentioned.

- First scientific study occurred by Arab traders.
- In 17th century Sir Edmund Halley explained thermal contrast that means differential heating of ocean and continent changes wind direction and precipitation. But he did not explain well.

Modern theories:

In modern theories beside differential heating, shape of continent, Air mass, Orography, Jet streams are considered.

Classical theory:

Sir Edmund Halley gave thermal concept in 17th century. He said: during

During Summer - Sun is over tropic of cancer which leads to warm air and the air become light and goes up. It creates low pressure area over central Asia.

At this time there is high pressure over Arabian Sea and Bay of Bengal. Due to which pressure gradient occurred.

Pressure Gradient: Ocean $\rightarrow$ Landmass (Summer)

- Bringing heavy rainfall - Indian Subcontinent
(Winter monsoon):

- Sun is over tropic of capricorn
- Indian landmass become colder than Arabian sea and Bay of Bengal. Hence high pressure develops over Indian continent

- low pressure develops over Arabian sea

Pressure Gradient: Landmass $\rightarrow$ Ocean

So, Basic Idea behind - classical theory is similar to - land and sea breeze in summer and winter.

Also, Draw backs:

1. Monsoon donot develop equally everywhere on earth.

2. Hailley's thermal concept fails,

Sudden burst of Monsoons

Delays in onset of monsoons sometimes

Modern theory (Dynamic concept).

- It was given by Fohn.

- According to this theory, Monsoon - modification of planetary winds of the tropics. It is based on ITCZ migration in different seasons.

- Wherever trade wind converges, maximum clouds and heavy rainfall occurred.

In summer: ITCZ shifts northward (as much as $20^{\circ}N$)

- South east tradewind of southern hemisphere cross equator and starts blowing: SW ~~and~~ direction under influence of coriolis force

- Also becomes SW monsoon

- Southwest monsoon - meet North east tradewinds which is called as monsoon front (ITCZ)

Therefore, rainfall occurs along the front

- In July - ITCZ shifts 20° - $25^{\circ}N$ - Indo Gangetic Plain + Himalayan Ranges } - Yield Rainfall } - called Monsoon Trough (high rain)

Modifications (by Fohn)

- Earliest he said monsoon is due to ITCZ movement only.

29
S. to - But he added equatorial westerlies.
He said when south east trade wind convert into
sw trade wind it also added equatorial westerlies
with it in delatrum region. Which intensifies monsoon.

If monsoon due to thermal and dynamic
concept, all monsoon should have been successfull.
But that is not the case. Many year monsoon fails.

For better understanding (Monsoon) - Govt of
India launched joint campaign - MONEX (2) - with
then Soviet Govt

↓
Monsoon expedition

- Helped understanding monsoon

- For 1st time - highlighted role of many
factors

For 1st time - highlighted role of

(1) Circumpolar whirl and Jet streams

(2) Tibet Plateau and Himalayas

- Source of Heat

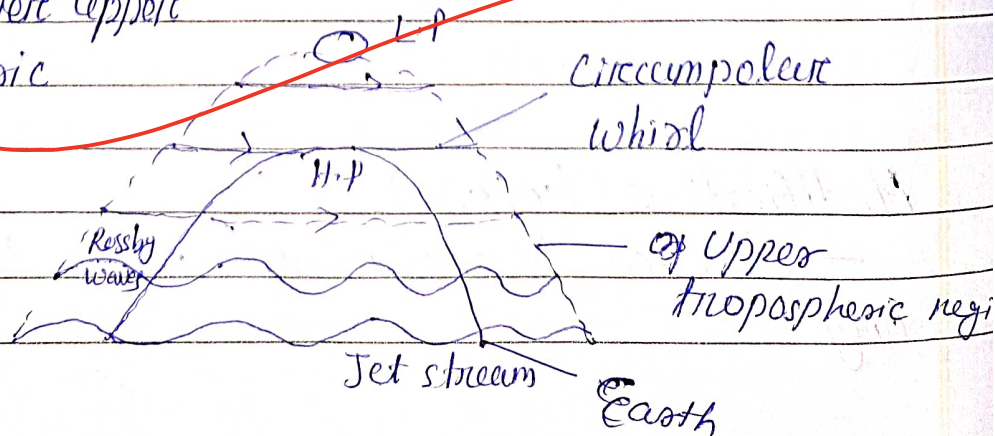
- Mechanical Barrier

(3) El Nino

(4) Southern Oscillation

} ENSO Event

(1) Circumpolar whirl - It is a jet stream. It
present over upper
tropospheric
region



- at polar high temperature, very low so air sinks downward

- In ground level there air moves downward and due to coriolis force it moves to subtropical region.

- At ~~tropics~~ from polar region to subpolar low pressure region.

- In upper tropospheric part vacuum is created.

Air from the surrounding converge to fill the vacuum.

- Such converging air - Turns - Right (Northern Hemisphere)
- Turns - left (Southern Hemisphere)

- North Pole :

Upper air whirl - counterclockwise known as

- Circumpolar arctic whirl

- South Pole :

Upper air whirl - clockwise known as

- Circumpolar antarctic whirl

- The equatorial position of these whirl - Jet stream

Whirl - More stronger - winter

So, winter jet - more stronger than - Summer Jet

(2) Role played by Tibet and Himalayas

During winter :

Arctic whirl stronger than Antarctic whirl

So, westerly Jet stronger than Easterly Jet

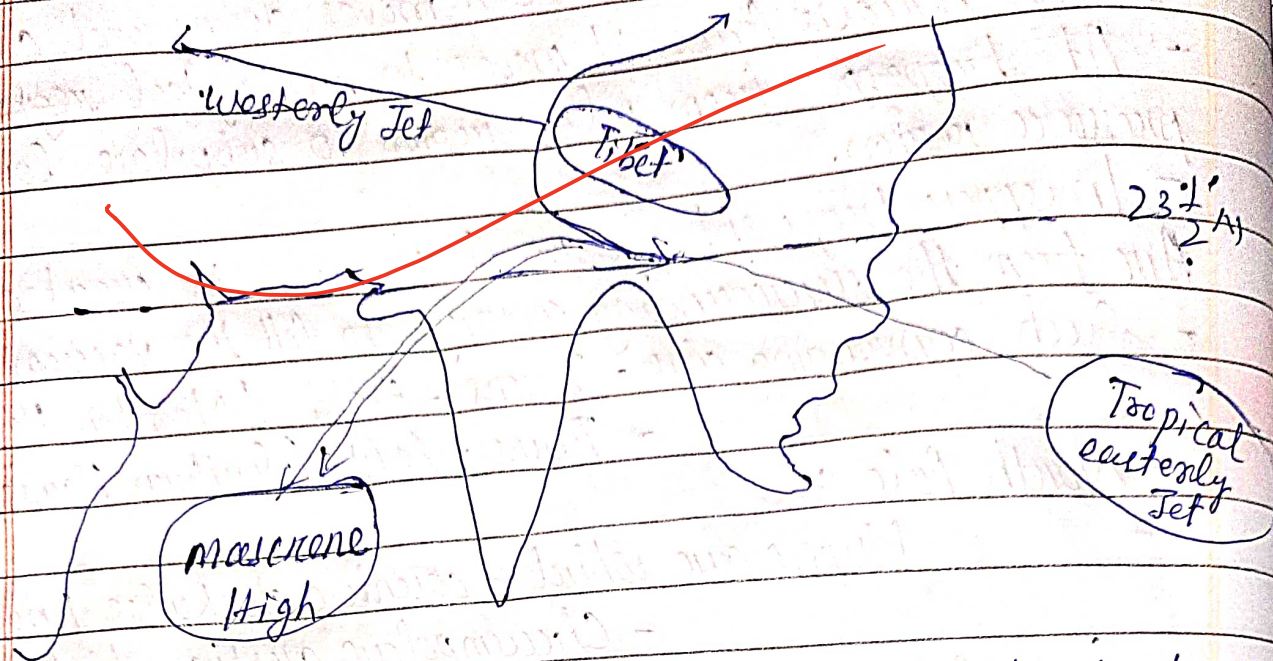
~~Westerly Jet - migrates towards equator~~

- It is obstructed and bifurcated by Himalayan Tibet complex

- Southern branch enters India

The southern branch creates - upper air dynamic high pressure (UADH)

UADH - remains generally till may



By April and May - Subcontinent starts heating up



Intense belt low pressure is created from Karachi to Kolkata



known as Monsoonal Trough

In upper part high pressure is created and in lower part low pressure is created. The low pressure air can not go up due to upper high pressure.

By this time - Mascarene high - also develops

So, Surface air starts moving: Mascarene high



Monsoonal Trough

But, presence of upper air dynamic high during April and May air cannot rise

Hence, despite high temperature - April and May - practically rainless.

But during June - Summer Solstice
Antarctic whirl - strengthens itself
Therefore, Easterly Jet comes in path of Sub tropical
westerly Jet

The tropical easterly crosses the equator due to
because it is quite strong than westerly Jet due to
large ocean dominant over southern hemisphere

Thus Easterly Jet - pushes subtropical westerly jet
north of Tibet Plateau in central china. It removes
upper air dynamic high pressure blockage

Therefore, Quick rise + Sudden cooling } known as
+ horizontal divergence } burst of
monsoon



Occurs at Kerala
(1st June approx)

Reason:

- Once upper air dynamic high is destroyed the entire
system comes into motion.
- Hot moist wind - that moves into Malabar coast - obstructed
by W. Ghats

By 20th June - entire subcontinent comes under monsoon
al impact.

After crossing the equator tropically easterly jet
travels a certain distance and sinks in monsoon high.
Then this intensified monsoon.

Need to write more on

→ weather characteristics
like

Sudden Burst
Gradual retreat
October heat

→ Prediction?