Theories of Land form Development

1] Davis Theory

2] Penck's Theory

Slope & Slope studies -

- Slopes are facets or elements of inclination of the face of the land forms
- Slopes together forms land forms & slopes can be of diff types & if we understand how slopes are formed we can extend our knowledge to how land forms are formed

Slopes classification

I] On the basis of origin

a] Endogenic slopes / Tectonic slopes

b] Exogenic slopes

- Because of agents of Denudation

- Extrusive slopes
- Intrusive slopes (Hypabyssal)
- Aggradational/ Deposition slopes
- Degradational/ Erosional slopes

★ Slopes because of volcanic accumulation can also be called as Accumulation) Aggradational slopes

II] Classification on the basis of slope Angles

a] concave slope
b] convex
c] straight
d] Belt linear
e] Overhang face slope (slope angle is 90°)

- Slope angle is also called as **Dip Angle** which is measured as Acute Angle with horizontal

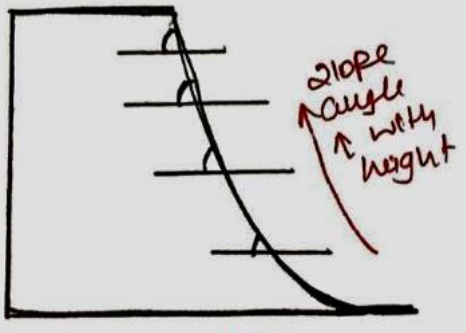
a] Concave slope - slope angle increases with the height. They are also called as Basal C because they are commonly found in lower heights at base level

b] Convex slope - slope angle decreases with height

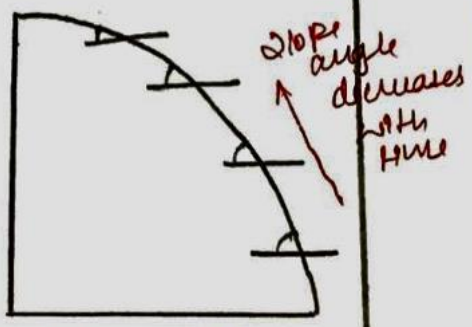
- They are also called as summital convexity because they are found at higher heights

c] Straight slopes / Rectilinear slopes - slope angle remains same with height (Debris controlled slopes)

d] Scarp face slopes - A special type where slope angle is always 90°

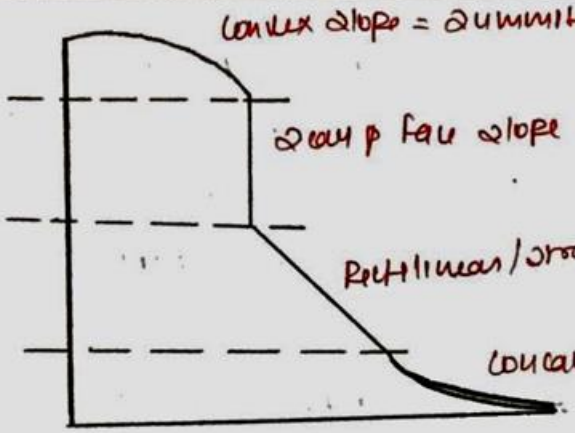


Concave slope

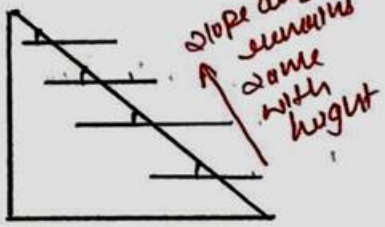


Convex slope

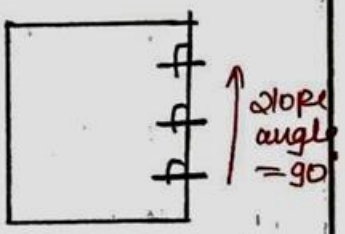
Convex slope = summited/ convexity



An ideal slope has all the elements as shown



Straight slope



Scarp face slope

Models of Slope Studies -

1] Davis Model of slope evolution - part of Historical Approach called as Slope Decline Model / Down Wasting Model

2] Penck's Model called as Slope Replacement Model

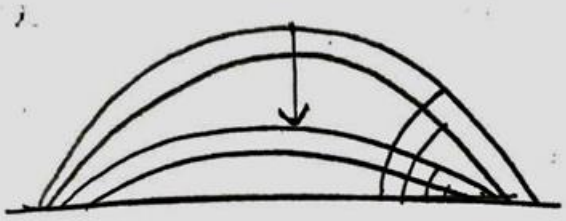
3] L.C King's Model also called as Slope Retreat Model. / Back Wasting Model / Parallel Retreat Model / Epigene Cycle of Slope Model / Pediplanation Model / Savannah Cycle of erosion

1] Davis Model / Model of Down Wasting / Slope Decline Model.

- Slopes decline from top towards down
- Slopes become progressively gentle i.e steep slopes become gentle slopes
- Type of slopes are a function of age of slopes → Youth age - Convex slope

- Mature stage - straight slope
- Senile stage - Convex slope

- Above slope changes are because of River erosion & Deep igneous endogenic forces & other agencies of erosion
- The final slopes are very gentle and relatively flatten



Youth - ~~concave~~ Convex slope

Old stage - Concave slope

2] Penck's Model | Slope Replacement Model –

- Slopes = f (processes)
- No role of time
- Process depends on Endogenic & Exogenic & they also depends on Rock structure
- Role of Rock structure Penck had incorporated by acknowledging ⓐ Role of initial slopes, ⓑ rock hardness, ⓒ degree of ease of rocks disintegration
- ⓓ Role of cohesion & Adhesion in rock fragments & sediments

(★ Penck's refers to Degree of reduction, degree of exposure & degree of removal of sediments]

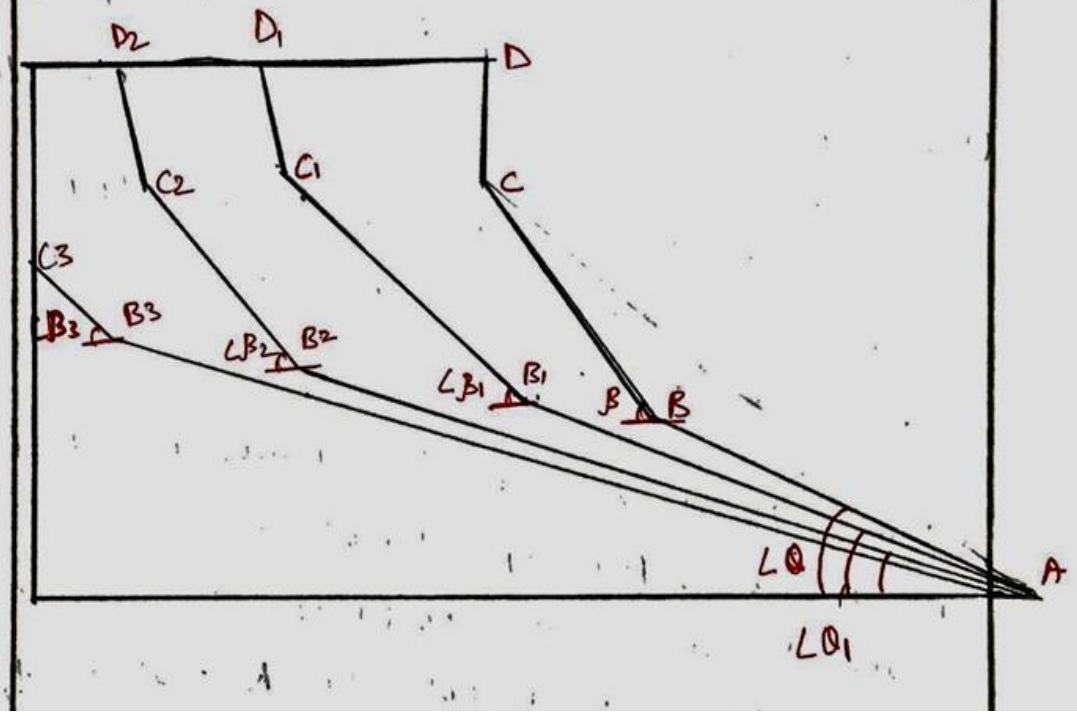
★ Penck's Model of Slope Development is largely misunderstood. For long, Penck's model was considered to be the Model of slope retreat Now we know, it is not slope Retreat Model, it is slope Replacement Model & slope Retreat is more associated with L.C King's Model

Slope changes as described below -

a] Slope Development happens from below.

b] In slope Replacement, creep slopes are replaced by Gentle slopes

c] Gentle slopes grow at the cost of creep slopes



- In the diagram above, initial slope segments ABCD replaced by $AB_1C_1D_1$ - into $AB_2C_2D_2$ & into AB_3C_3

- The uppermost segment AB is replaced by AB_1 such that initial angle θ replaced by θ_1 & AB_1 grows longer than AB. similarly slope segment BC replaced by B_1C_1 where $\angle B_1$ & $\angle B$ & B_1C_1 is longer than BC

- In the above model of slope Replacement, final slopes are very gentle & landscapes will eventually reduce in heights but not like Top-down slope decline of Davis

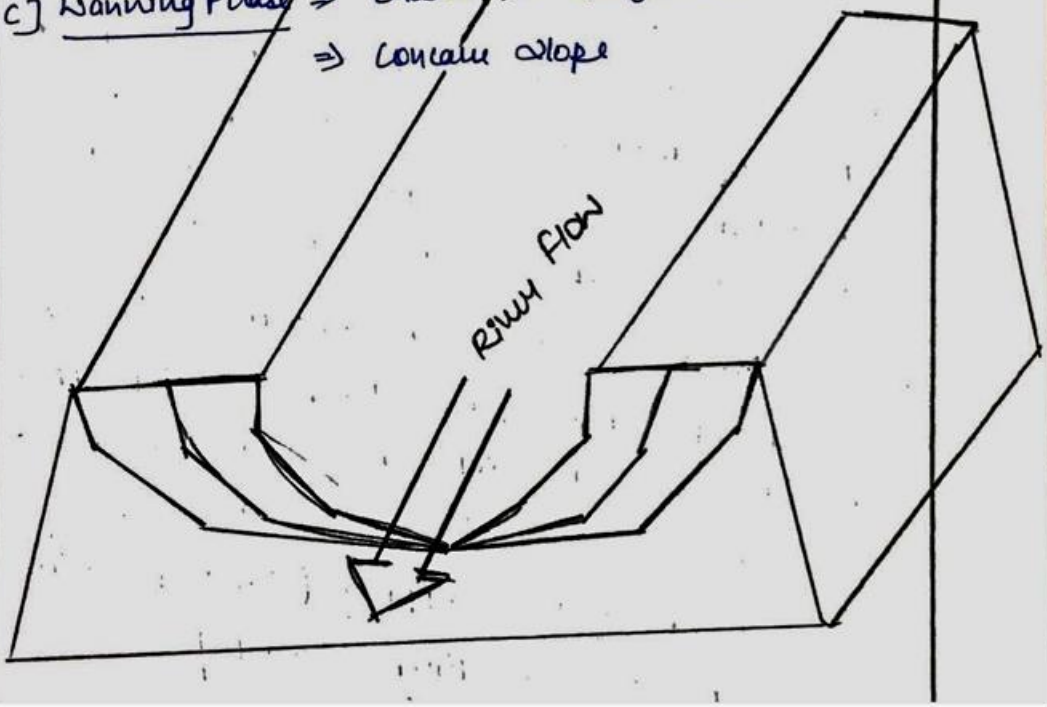
- Unlike Davis Model where rivers performs the Role of erosion, for Penck's Model - Rivers at the base of slopes perform the role of transportation of sediments alone - a process of Basal wapping (This is a more imp concept in L.C. King's Model)

- Type of slopes acc. to Penck are a function of phase of land form change -

a] Waning phase ⇒ Uplift rate > Erosion
⇒ Convex slope

b] Phase of constant Growth ⇒ summit erosion = Valley Deepening
⇒ Straight slope

c] Waning Phase ⇒ Erosion > Uplift rate
⇒ Concave slope



PYQs

Que Analyse the differences in the model of slope evolution proposed by Davis & Penck (1990) (20M)

Que Write short note on: Polycyclic landforms (1991) (15M)

Que Describe the land forms which are products of endogenetic forces (2004) (60M)

Que Geological structure has a dominant control on land forms & is reflected on them. Discuss (2016) (15M)

Que Discuss role of slope, Altitude & Relief in Landscape Development (15M) (2022)