

# KSU CET

**S1 & S2 Notes**

2019 Scheme



## MODULE 1

# RELEVANCE OF CIVIL ENGINEERING

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## IMPORTANCE OF INFRASTRUCTURE DEVELOPMENT

- Healthy and comfortable housing facility.
- Improvement of transportation and communication
- safe and scientific based disposal
- safe domestic and industrial water supply.
- protection from flood.
- Increase in food production.
- Generation of electricity, solar, hydal.
- Improved well prosperity and standards of living.

## ROLE OF CIVIL ENGINEER IN INFRASTRUCTURE DEVELOPMENT

- (\*) construction of residential, commercial and industrial buildings for urban and rural area
- (\*) Town and city planning.
- (\*) construction of roads, rails, port, harbour and airports
- (\*) construction of dams
- (\*) providing domestic, Agricultural and industrial water supply
- (\*) providing secure waste disposal
- (\*) Maintenance of facility for all the structures.

(\*) Rehabilitation and repair of structures

(\*) Improving standards of living.

(\*) construction of energy efficient building (green building)

## RESPONSIBILITY OF CIVIL ENGINEER FOR SAFETY OF BUILT ENVIRONMENT

### HAZARDS

1. Fire due to short circuit
2. Falling of material, persons.
3. Fall of equipments.
4. Electrical hazards.
5. Accidents due to heavy excavation.

### RULES

Blue Helmet - supervisor

White Helmet - Engineer.

Yellow Helmet - workers

- (\*) observe and obey general safety rules and regulation
- (\*) Implement effective supervision at work place
- (\*) Implement relevant safety measures for all activities.
- (\*) Implement Permit to work as and what is required.
- (\*) Implement good house keeping practice.
- (\*) ensure personal protective equipments as tools are available at sight before starting the job.

- (\* ensure fire protection measures are available at sight.
- (\* render help to injured personals and provide immediate medical facility.
- (\* Report all accidents or incidents to the safety officer without delay.
- (\* ensure relevant safety instructions giving and symbols are displayed in the prominent Areas.
- (\* ensure health safety and welfare measures for the work force are very effective.

## VARIOUS DISCIPLINES OF CIVIL ENGINEERING

- (\* construction engineering.
- (\* structural engineering
- (\* transportation engineering
- (\* environment Engineering
- (\* water resource engineering
- (\* geotechnical engineering.
- (\* surveying and remote sensing.

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## TYPES OF BUILDING

→ BASED ON OCCUPANCY IMP

GROUP A → Residential building

Buildings which provide accomodation and dining.  
eg: House, villa, flats/Apartments. etc.

GROUP B → Educational building

Buildings which provide educational facilities.  
eg: schools, colleges etc.

GROUP C → Institutional buildings.

which provide medical treatment  
correction homes, adage homes etc.

GROUP D → Assembly buildings.

Buildings which provide seats for more  
than 50 members.

eg: Auditorium, Religious buildings etc.

GROUP E → Business building

eg: offices, Banks, shopping malls etc.

GROUP F → Mercantile buildings.

eg: shops.

GROUP G → Industrial buildings.

Buildings which are used for storage goods  
and manufacturing machines and assembling  
them.

eg: workshops, godowns, carriages.

GROUP H → storage buildings.

For storing goods.

## GROUP 1 → Hazardous buildings

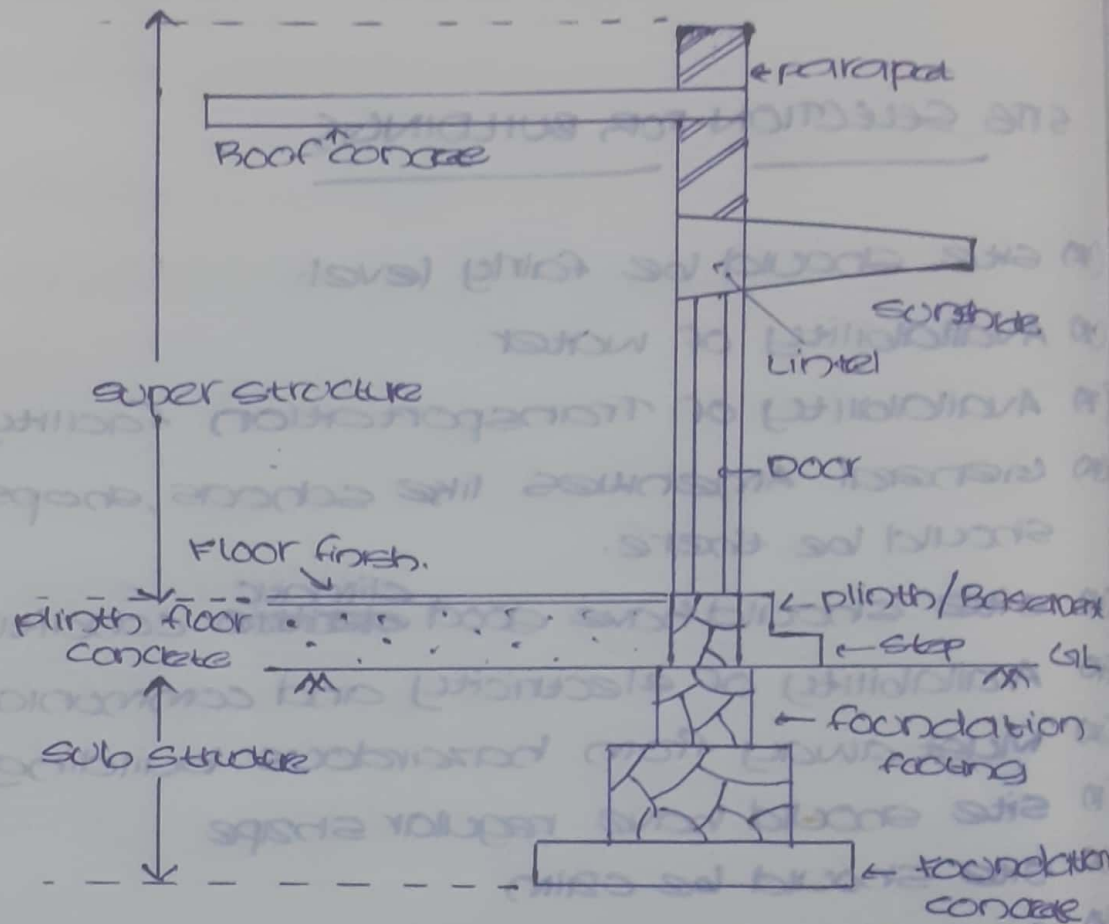
used for storing explosive things.

### SITE SELECTION FOR BUILDINGS

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- (\*) site should be fairly level.
- (\*) Availability of water.
- (\*) Availability of Transportation facility.
- (\*) General Amenities like schools, shops, hospitals should be there.
- (\*) site should have good ~~climate~~ <sup>climate</sup> conditions.
- (\*) Availability of electricity and communication Facility.
- (\*) Must away from hazardous buildings.
- (\*) site should have regular shape
- (\*) site should be calm
- (\*) site should have good natural ventilation and lighting.
- (\*) site should have proper drainage facility.
- (\*) site prone to air or water pollution should be avoided.
- (\*) Flood prone areas, water logged areas, reclaimed area should be avoided.
- (\*) ownership should be checked before buying a land.

# COMPONENTS OF BUILDING



## 1. Substructure :-

(\*) construction below ground level

(\*) prevent ~~undermining~~ by burrowing of animals

(\*) load from Super structure safely transmit to sub structure.

(\*) provide firm surface for super structure.

(\*) prevent differential settlement.

(\*) prevent overturning of building

(\*) prevent failure due to undermining due to burrowing animals.

2. Plinth :-

(\*\*) Basement

- (\*\*) Load from super structure to sub structure.
- (\*\*) Act as a retaining wall for inside filling.
- (\*\*) carry all live ~~loads~~ loads inside building.
- (\*\*) prevent moisture or dampness.
- (\*\*) Improve architectural appearance of building.

3. Super structure :-

(\*\*) portion above plinth, which include floor finish, step, walls, lintel, sunshade

(a) walls

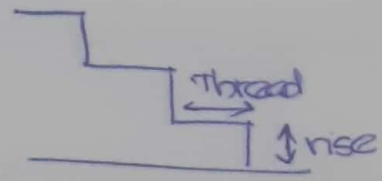
- (\*\*) fire resistant
- (\*\*) support

(b) Floor

- (\*\*) to carry the equipments.

(c) steps and stairs

- (\*\*) provide access



B = 15 cm  
T = 30 cm

(d) Doors and windows

- (\*\*) provide access
- (\*\*) for lighting and ventilation
- (\*\*) fire resistant, durable

(e) Lintel and Beams

- (\*\*) provide openings



## (f) Roof

- (\*) provides cover to building
- (\*) protect from rain, sunshine.

roofing materials - sheet,  
(it should resist leakage)

## (g) parapet

- (\*) protection

(\*) മൂലം മഴയും സൂര്യനും നഷ്ടപ്പെടാതെ പാർക്കുന്നു.  
നിർമ്മിക്കുന്നു.

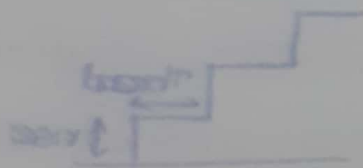
## (h) wall finishing.

- (\*) paint

(Primer use നമുക്കും  
അല്ലെങ്കിൽ Synthetic enamel paint  
use നമുക്കും).

## BUILDING REGULATIONS

1. NBC
2. KMBR
3. CBZ rules.



- general requirements.
- open air space
- size of rooms
- lighting and ventilation.
- ~~fire~~ Fire safety rules.

## 1. National Building code :-

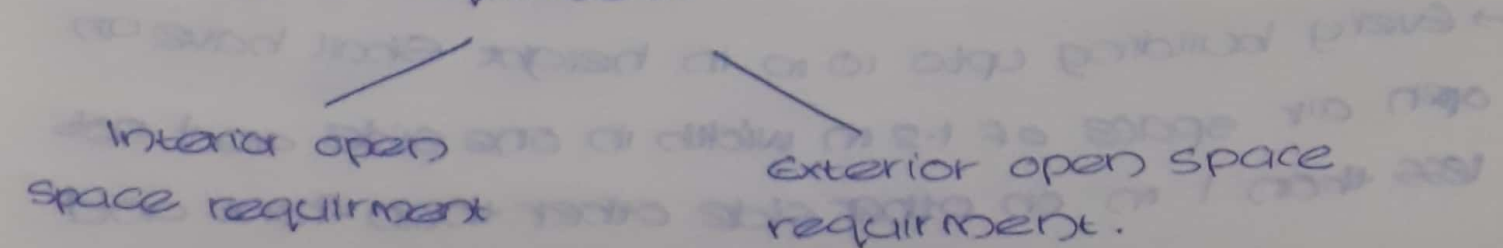
- part 0 :- Integral approach.
- part 1 :- Definitions
- part 2 :- Administration.
- part 3 :- Development control rules and general Building requirements.
- part 4 :- Fire and safety.
- part 5 :- Building materials.
- part 6 :- structural designs.
- part 7 :- constructional practice and safety.
- part 8 :- Building services.
- part 9 :- plumbing services.
- part 10 :- Landscaping, signs and outdoor display structures.
- part 11 :- Building requirements.

## \*→ Relevance of NBC :-

1. development and Building planning.
2. structural design aspects.
3. construction and asset facility management.
4. Building services.
5. plumbing services and solid waste management.

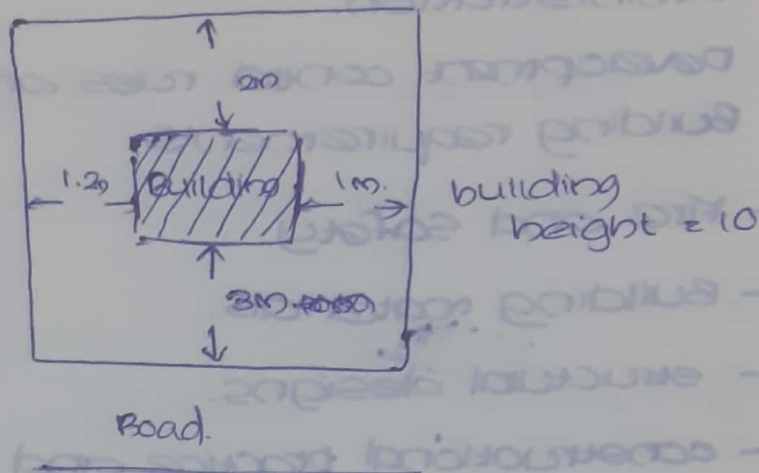
## KERALA MUNICIPALITY BUILDING RULE (KMBR)

1. open space requirement.



## set back

distance b/w building line boundary line



For every increase in the height of building by 3, a 0.5 m is added to every side.

eg: building height = 13

3 m become 3.5

1.2 m  $\rightarrow$  1.7

1 m  $\rightarrow$  1.5

2 m  $\rightarrow$  2.5

1  $\rightarrow$  every building upto 10 m in height shall have a minimum front yard of 3 m depth (clearance from the boundary)

2  $\rightarrow$  every building upto 10 m in height shall have a minimum rear yard of 2 m in depth.

3  $\rightarrow$  Every building upto 10 m in height shall have an open air space of 1.2 m width in one side and not less than 1 m on other side other than front and

rare yards.

4 → For buildings above 10 m in height 0.5 m ~~width~~ per increase for every 3 m height is to be provided apart from minimum front, rare and other side open spaces.

MINIMUM CLEARANCE FROM OVERHEAD WIRE

5 → For building above four storeys from ground level a minimum open space of 5 m is to be provided on any one side converges to front side.

6 → For the building constructed on small plots, i.e. plot area less than  $125 \text{ m}^2$ , to the exterior open spaces as follows 1.8 m front yard, rare yard 1 m side yard 0.9 and 0.6.

### INTERIOR

1 → Any habitable room, not abutting on front, rare or side open space shall abide on an interior open space with a minimum width of 2.4 m.

2 → If the total height of the building is less than 7 m, then the interior open space shall have 1.5 width.

### GENERAL REQUIREMENT REGARDING PLOT

1 → Avoid plot where refuse excreta or other offensive matter is deposited.

2 → The plot having ~~plot~~ with big pits or quarry should be avoided.

3 → The plot have slope more than  $45^\circ$  should be avoided.

4 → Area prone flood should be avoided. Ⓞ

5 → Area marked as coastal regulation zone should be avoided.

### MINIMUM CLEARANCE FROM OVERHEAD LINES

Sl. No.	TYPE OF LINE	VERTICAL CLEARANCE	HORIZONTAL CLEARANCE
1.	Low and medium voltage line.	2.40 m	1.20 m
2.	upto 33 kv line	3.70 m.	1.80 m
3.	More than 33 kv lines	3.70 m + 0.30 m for every additional 33 kv	1.80 + 0.30 m for every additional 33 kv

### AREA TERMS

↳ plinth area -

the ~~width~~ built covered area measured at the floor level of the basement or of any storey.

2. Floor area :-

The built covered area ~~area~~ in all floors including basement floor.

3. carpet area :-

\* → total built up covered area including car porch.

\* → the covered area of the usable rooms at any floor level (excluding area of walls)

\* → Area of staircases, lift well, escalators, duct etc are ~~lift well, escalator~~ also excluded.

4. Floor area ratio :-

it is the quotient obtained by dividing total floor area on all floors by the plot area.

$$FAR = \frac{\text{total floor area of all floors}}{\text{plot area.}}$$

5. coverage :-

it is the covered area of building, normally expressed as percentage of plot area.

$$\text{coverage} = \frac{\text{covered Area}}{\text{plot area}} \times 100$$

## COASTAL REGULATION ZONE RULES (CRZ)

Issued by Ministry of Environment and Forests, Government of India as part of environmental protection act to protect coast from eroding and to preserve its natural resources, under this rule the entire coastal threat from the lowest low tide line to highest high tide line and the coastal land within 500 m from the high tide line on the landward side is termed as CRZ.

CRZ is classified into four categories

### 1:- CRZ 1 :-

Area that are ecologically sensitive and the geomorphological features which play a role in the maintaining the integrity of coast.

### 2:- CRZ 2 :-

Areas that have been developed upto or closed to the shore line.

### 3:- CRZ 3 :-

Areas that are relatively undisturbed and those do not belong to either CRZ 1 or CRZ 2 which include coastal zone in the river areas and also areas within municipal limits or in other legally designed urban areas which are not substantially built up.

4:- CBZ 4:-

WATER RESOURCES

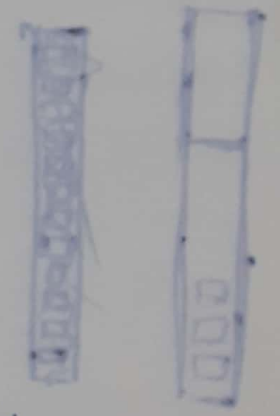
The water area from the low tide line to 12 nautical miles on the sea <sup>ward</sup> side.

OBJECTIVE

- To ensure livelihood security to fisher community and other local communities living in the coastal areas.
- To conserve and protect coastal structures.
- To promote development through sustainable manner.

PROHIBITED ACTIVITIES

- New industries other than permitted.
- Disposal of hazardous substance.
- New fish processing unit.
- New effluent or waste treatment plan.
- Disposal of untreated waste and effluents.
- Dumping of city or town waste or ash from thermal plants.
- Land reclamation.
- Mining of sand, rock or corals.
- Harvesting or extraction of ground water other than manual wells for domestic purpose.
- constructions other than permitted ones.





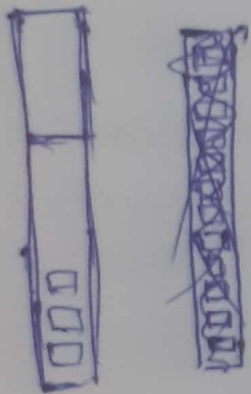
# VERTICAL MEASUREMENT

levelling → process of measuring relative height process

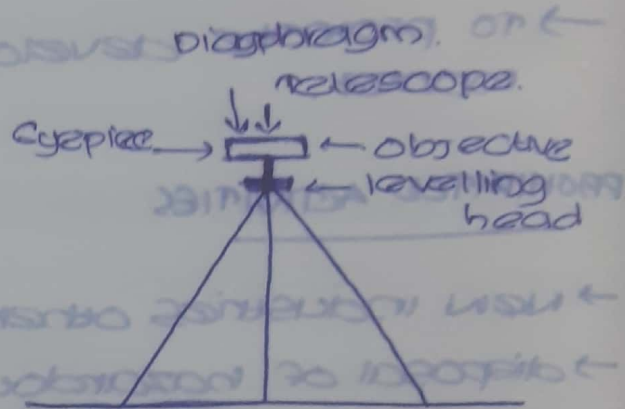
Instrument used → Dumpy level + tripod + levelling staff

Instrument placed on instrument station.

levelling staff :-



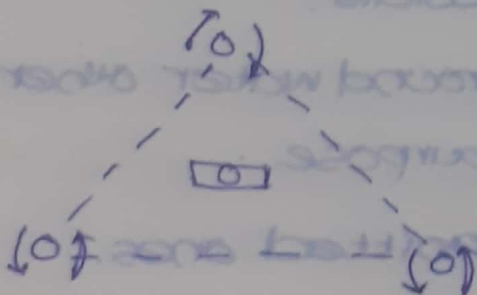
thickness of small band = 5 mm



Instrument station

1. setting up the level

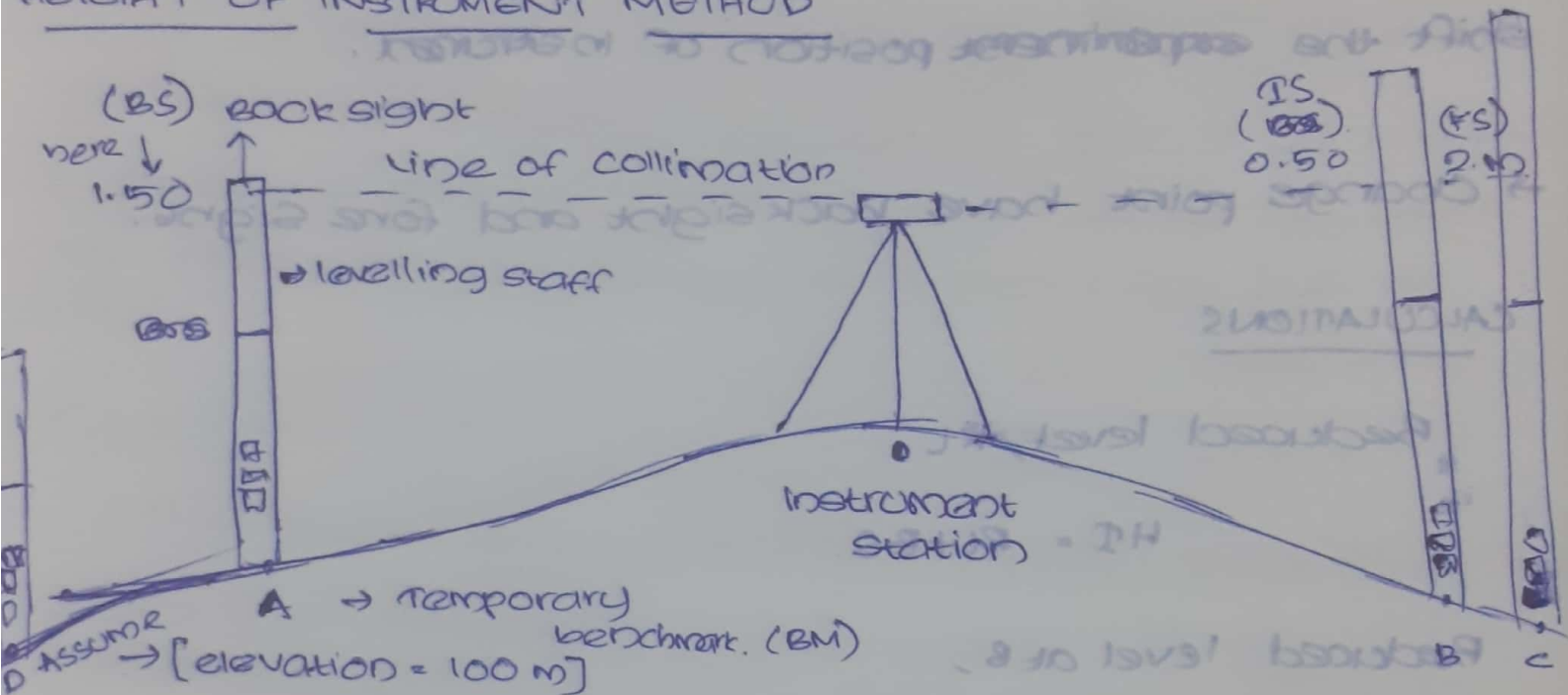
2. levelling up



### 3. elimination of parallax

focus eye piece , diaphragm adjust.

### HEIGHT OF INSTRUMENT METHOD



Datum → Non elevation point

Benchmark (BM) → point of Non elevation.

→ Fix levelling staff on A

(Back sight → first reading taken after placing levelling staff).

[ level field book

Station	Backsight	Inter mediate site	HI (Height of Instrument)	RL (Reduced level)	Remarks	FS (Fore sight)
A	1.50		101.50	100	Benchmark	
B						
C		0.50	101.50	101	CP. (change point)	2m

consider point B,

staff placed on B

when depth increased, D is not visible so

shift the ~~experiment~~ position of instrument.

→ Change point have back sight and fore sight.

CALCULATIONS

Reduced level, RL

$$HI = RL + BS.$$

→ Reduced level at B,

$$RL = HI - IS$$

Reduced level at C

$$101.50 - 2 = 99.50$$

$$\sum BS - \sum FS = \text{Last RL} - \text{First RL}$$

$$1.50 - 2.00 = 99.50 - 100$$

$$-0.50 = -0.50$$

Station	Back sight (BS)	Reduced level (RL)	Height of instrument (HI)	Fore sight (FS)	Reduced level (RL)
A	1.50	100	101.50		
B		101	101.50	2.00	99.50
C					

→ station :-

A point where the levelling staff held is called station.

→ line of collimation :-

The line passing through the optical centre of the objective and the point of intersection of cross hairs in front of the eye piece is known as line of collimation.

→ Instrument station :-

The point where instrument placed.

→ Height of Instrument :-

The elevation of line of sight with respect to the assumed datum.

$$HI = RL + BS$$

→ Back site :-

The first site taken after fixing the instrument.

→ Fore site :-

The last site taken before shifting the instrument.

→ Intermediate site or IS :-

The site taken between back site and

Fore site

→ change point, cp :-

The point where both back site and fore site are taken. The instrument is shifted or changed from one point to another at this point.

$$HI = RL + BS$$

$$(Next) RL = HI - IS$$

→ Arithmetic check :-

$$\sum BS - \sum FS = Last RL - First RL$$

→ level field book :-

A field book or the level book used for entering each staff reading during levelling.

→ The following readings are taken on level instrument with station A as benchmark with RL 100 m. The instrument is shifted after 4th and 7th reading, the readings are 1.200, 0.980, 1.035, 0.650, 1.100, 0.950, 0.700, 1.400, 1.00 and 0.880. Enter these readings in the field book and find out the RL.

Ans)

Station	BS	IS	FS	HI	RL	Remarks
A	1.200			101.200	100.00	BM
B		0.980			100.22	
C		1.035			100.165	
D	1.100		0.650	101.65	100.55	C.P.

	BS	FS	FS	HI	RL
E	1.00	0.950			100.70
F	1.400		0.700	102.35	<del>100.95</del> 100.35 = CP <sub>2</sub>
G		1.00			101.35
H			0.880		101.47

$$HI = RL + BS$$

$$= 100 + 1.200$$

$$= \underline{101.200}$$

$$RL_B = HI - IS$$

$$= 101.200 - 0.980$$

$$= \underline{100.22}$$

$$RL_C = HI - IS$$

$$= 101.200 - 1.035$$

$$= \underline{100.165}$$

$RL_D = HI - FS$ $= 101.200 - 0.650$ $= 100.55$		$RL_E = HI - IS$ $= 101.65 - 0.950$ $= \underline{100.70}$
$HI_D = RL_D + BS$ $= 100.55 + 1.100$ $= \underline{101.65}$		$RL_F = HI - FS$ $= 101.65 - 0.700$ $= 100.95$
$RL_G = HI - FS$ $= 102.35 - 1.00$ $= \underline{101.35}$		$HI = RL_F + BS$ $= 100.95 + 1.400$ $= \underline{102.35}$
$RL_H = HI - FS$ $= 102.35 - 0.880 = \underline{101.47}$		

Arithmetic check

$$\sum BS - \sum FS = \text{Last RL} - \text{First RL}$$

$$3.70 - 2.230 = 101.47 - 100.00$$

$$1.47 = 1.47$$

→ The following staff readings were observed successive with a level instrument having we moved after third, sixth and eighth readings. readings are 2.228, 1.606, 0.988, 2.090, 2.864, 1.262, 0.602, 1.982, 1.044, 2.684 enter the above readings in a field book and calculate RL of points if the first reading was taken with a staff held on benchmark of 432.84 ms.

Ans)

STATION	BS	IS	FS	HI	RL	REMARKS
A	2.228	-	-	434.62	432.84	BM
B		1.606			433.006	
C	2.090		0.988	435.714	433.624	CP <sub>1</sub>
D		2.864			432.85	
E	0.602		1.262	435.014	434.452	CP <sub>2</sub>
F	1.044		1.982	434.116	433.072	CP <sub>3</sub>
G			2.684		431.432	
H						

$$HI = RL + BS$$

$$= 432.384 + 2.228$$

$$= \underline{\underline{434.612}}$$

$$RL_B = HI - IS$$

$$= 434.612 - 1.606$$

$$= \underline{\underline{433.006}}$$

$$RL_C = HI - FS$$

$$= 435.714 - 0.988$$

=

$$HI = RL_C + BS$$

=

Arithmetic check,

$$5.964 - 6.916 = -0.952$$

$$last RL - first RL = -0.952$$

28/12/20