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Internal Assessment Test -3

Sub: Basic Surveying

Date: 07/03/2022

Duration: 90 mins

Max Marks: 50

Sem: III

Sections: CV (A)

Code: 18CV35

Answer *any five* questions. Good luck!

	Marks	OBE	
		CO	RBT
1. Define the terms: (i) True bearing (ii) Magnetic bearing (iii) True Meridian (iv) Magnetic meridian (v) Isogonic lines.	10	1	L1,L2
2a. With a neat sketch, derive the expression for area of Prismoidal section.	5	1	L1,L2
2b. Explain the importance of areas & volumes.	5	2	L1, L2
3. Explain in detail calculating areas by (i) Average Ordinate method (ii) Mid ordinate method.	10	2	L1,L2
4. Explain Trapezoidal rule & Simpson rule.	10	2	L1,L2
5. The following offsets were taken at regular intervals of 80m. Calculate the areas by (i) Trapezoidal rule (ii) Simpson rule. Offsets: 0, 3.5, 5, 9, 8,7 and 5.5m respectively,	10	1	L1,L2
6. The following bearings were observed from a Prismatic Compass. Calculate the interior angles of the closed Traverse.	10	1	L1,L2

Line	Fore Bearing
AB	60°30'
BC	122°00'
CD	46°00'
DE	205°30'
EA	300°00'

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BASIC SURVEYING ASSIGNMENT

GREESHMA - B |
ICR20CV006

IAT - 1

- Q1) Define the terms : (i) True bearing (ii) Magnetic bearing
(iii) True meridian (iv) Magnetic meridian (v) Isogonic lines

Ans: iii) It is a line passing through a point P in the given plane & intersecting with north pole & south pole with the surface of the earth. (2M)

ii) It is the horizontal angle made by one end of a survey line with the magnetic meridian. (2M)

i) It is the horizontal angle made by one end of a survey line with the true meridian (2M)

iv) It is the direction shown by a freely floating magnetic needle which is always balanced & free from magnetic forces (2M)

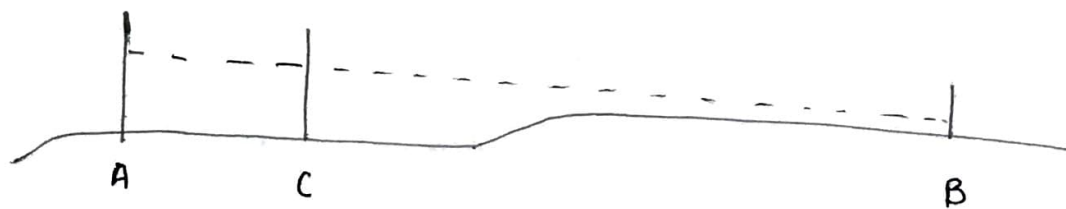
v) A line on a map joining points on the earth's surface at which the magnetic declination is the same. (2M)

- Q2) With a neat sketch, explain the field procedure of direct & indirect ranging.

Ans:- Direct ranging :-

This is possible only if the first & last points on the survey line are mutually intervisible.

The end points A & B in a survey line is intervisible. To locate point C on line AB, which is slightly less than a chain length from A. At points A & B ranging rods are erected. The assistant of survey positions himself as close to line AB as possible at a distance slightly less than a chain length & hold a ranging rod. He positions himself approximately 2m behind A & sights ranging rods A & B. He directs the assistant to move to the left or right of line AB till he finds the ranging rods at A, B & C in a line.

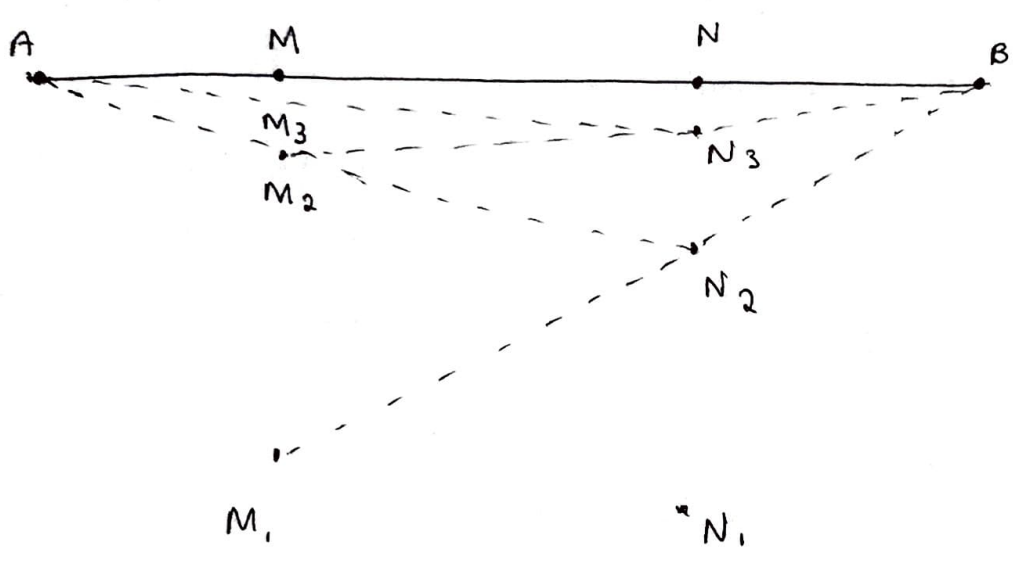
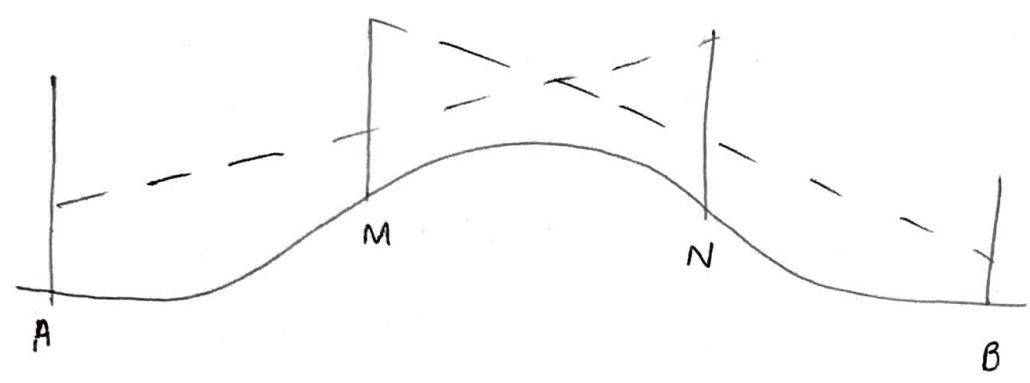


Indirect ranging :-

If the two end points of the line to be measured are not intervisible, the surveyor has to go for indirect ranging. The points may be invisible due to unevenness of the ground or due to long distance.

In the fig. M & N are the two points to be fixed on AB such that both points are visible from A as well as B. It needs four people to fix points M & N one person near each point A, B, M & N

3M



2M

Q3) Explain the principles of surveying.

Ans: 1) Work from whole to part :

In surveying large areas, a system of control points is identified & they are located with high precision. Then secondary control points are located using less precise methods.

With respect the secondary control point's details of the localized areas are measured & plotted. This is called working from whole to part. This principle in surveying helps in localizing the errors. If the surveying is ~~also~~ carried out by adding localized areas, errors accumulate

Explain

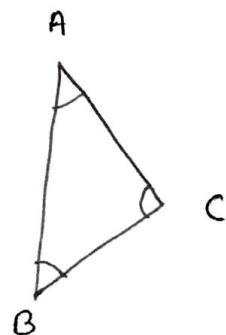
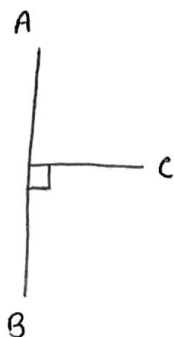
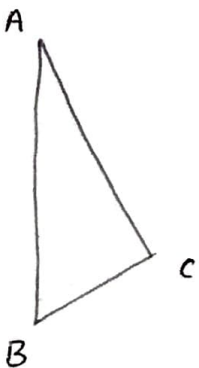
Errors

5M

2) Fixing positions of new control points :-

For fixing new control points with respect to already fixed points, at least two independent process should be followed.

- i) Using points A & B as the centres ascribe arcs and fix
- ii) Draw a perpendicular from D along AB to point C
- iii) To locate C, measure distance AB & use your protractor to equally measure angle ABC.
- iv) To locate C the interior angles of triangle ABC can be measured. The lengths of the sides AC & BC can be calculated by solving the triangle



5M

3

Explain in detail errors & sources of errors in surveying

Errors in surveying :-

Mistakes :-

These are errors due to carelessness of the observer. They may be due to wrong reading or recording of the observations. These errors are very large & can be easily detected

3M

Systematic errors :-

The errors which follow a well-defined pattern are classified as systematic errors. They can be determined by mathematical expressions. They are regarded as positive, if they make result too great & as negative if they make result too small.

3M

Accidental errors :-

These are errors in measured measurement which cannot be prevented, even with sufficient care. These ~~are~~ errors may be positive or negative their magnitude may vary from reading to reading.

Human eye has a limitation of distinguishing between two close reading.

4M

Sources of error :-

Instrumental errors :-

Instruments used for linear measurements may not be having true length due to manufacturing defects & instruments may not show true horizontal & vertical angles due to manufacturing defects or out of adjustments.

Natural errors :-

Errors will creep in because of the natural phenomena like variation in temperature humidity refraction, curvature of the earth & magnetic declination. They are to be properly accounted to arrive at exact values.

Human limitations :-

Human eye cannot distinguish between two points closer than 0.25mm. When the ends of a chain/tape line is marked, the thickness of line contributes to error, when next length is measured.

Carelessness :-

These errors are purely due to mistakes. They are quite large. They can be avoided by following good surveying practice by taking precautions & check readings

Difference
iii) T

3M

3M

2M

2M

Differentiate between (i) Plan & Map (ii) Accuracy & Precision (iii) ~~True Meridian~~ Prismatic Compass & Surveyor Compass.

Plan

It is an orthographic projection of features on or near the earth in the horizontal plane ~~whereas~~ map is non-orthographic

Plans are prepared for shorter areas to avoid distortion of the ground & curved features

Map

It is a non orthographic projection of features on or near the earth in the horizontal plane when the scale is small

Maps give additional information about the topography of the area with the help of contours

(3M)

Accuracy

Accuracy allows a certain amount of tolerance in a measurement

Precision

It demands exact measurement.

(2M)

Prismatic Compass

- 1) The needle is of broad needle type. It does not act as an index.
- 2) The graduated ring is attached to the needle the readings will be in WCB with graduations inverted.
- 3) Object vane will consist of metal vane with vertical hair. The eye vane consists of a small metal vane with slit.

Surveyor's Compass

- The needle is of edge type. The needle acts as an index also.
- The graduated card is attached to the box & not to the needle. The readings will be in QB system with the graduations engraved erect.
- Object vane will consist of metal vane with vertical hair. The eye vane consists of a small metal vane with a fine slit.

5M

Q6) A 20m chain was found to be 10cm too long after chaining a distance of 1500m. It was found to be 18cm too long at the end of the day's work after chaining a total distance of 2900m. Assuming the chain to be correct at the start of the day's work, find the true distance measured.

i) For first 1500 m :

$$l' = 1500 \text{ m}$$

$$d = 20 \text{ m}$$

$$\text{exp}^n = 10 \text{ cm}$$

$$\text{Avg exp}^n = \frac{0+10}{2} = 5 \text{ cm}$$

$$d' = 20 + \frac{5}{100} = 20.05 \text{ m}$$

$$l = ? , l' = 1500 \text{ m}$$

$$l = \frac{l'}{d} \times l^2$$

$$= \frac{20.05}{20} \times 1500$$

$$= 1503.75 \text{ m} \quad \text{--- (1)}$$

5m

ii) For next 1400 m

$$d = 20 \text{ m}$$

$$\text{exp}^n = 10 \text{ cm} \rightarrow 18 \text{ cm}$$

$$\text{avg exp}^n = \frac{10+18}{2} = 14 \text{ cm}$$

$$d' = 20 + (14/100) = 20.14$$

$$l = ? , l' = 1400 \text{ m}$$

$$l = \frac{20.14}{20} \times 1400 = 1409.8 \text{ m} \quad \text{--- (2)}$$

$$\text{Total distance} = \text{(1)} + \text{(2)}$$

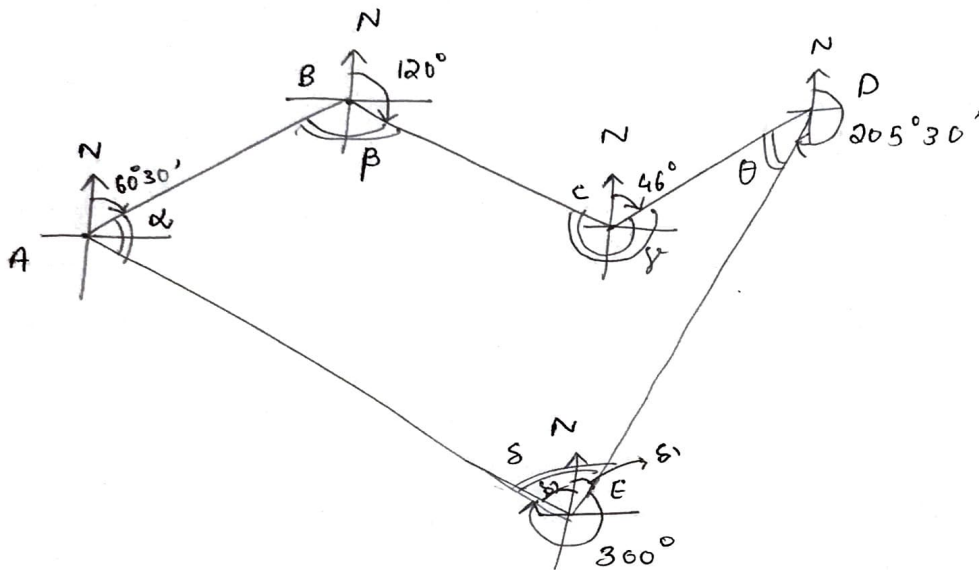
$$= 1503.75 + 1409.8$$

$$= 2913.55 \text{ m}$$

5m

Q7)

Line	F.B	B.B
AB	$60^{\circ}30'$	$180^{\circ} + 60^{\circ}30' = 240^{\circ}30'$
BC	$122^{\circ}00'$	$180^{\circ} + 122^{\circ} = 302^{\circ}$
CD	$46^{\circ}00'$	$180^{\circ} + 46^{\circ} = 226^{\circ}$
DE	$205^{\circ}30'$	$205^{\circ}30' - 180^{\circ} = 25^{\circ}30'$
EA	$300^{\circ}00'$	$300^{\circ} - 180^{\circ} = 120^{\circ}$



No. of sides (N) = 5

$$\begin{aligned}
 \text{Sum of interior angles} &= (2N - 4) \times 90^{\circ} \\
 &= (2 \times 5 - 4) \times 90^{\circ} \\
 &= 6 \times 90^{\circ} \\
 &= 540^{\circ}
 \end{aligned}$$

$$\Rightarrow \alpha + \beta + \gamma + \delta + \theta = 540^{\circ}$$

$$i) \alpha = \text{BB of EA} - \text{FB of AB}$$

$$= 120^\circ - 60^\circ 30'$$

$$\boxed{\alpha = 59^\circ 30'}$$

$$ii) \beta = \text{BB of AB} - \text{FB of BC}$$

$$= 240^\circ 30' - 122^\circ$$

$$\boxed{\beta = 118^\circ 30'}$$

$$iv) \gamma = \text{BB of BC} - \text{FB of CD}$$

$$= 302^\circ - 46^\circ$$

$$\boxed{\gamma = 256^\circ}$$

$$v) \theta = \text{BB of CD} - \text{FB of DE}$$

$$= 226^\circ - 205^\circ 30'$$

$$\boxed{\theta = 20^\circ 30'}$$

$$vi) \delta = \delta_1 + \delta_2$$

$$\delta_1 = \text{BB of DE} = 25^\circ 30'$$

$$\delta_2 = 360^\circ - \text{FB of EA}$$

$$= 360^\circ - 300^\circ$$

$$= 60^\circ$$

$$\Rightarrow \delta = 25^\circ 30' + 60^\circ$$

$$\boxed{\delta = 85^\circ 30'}$$

$$\Rightarrow \alpha + \beta + \gamma + \theta + \delta = 540^\circ$$

$$\Rightarrow 59^\circ 30' + 118^\circ 30' + 256^\circ + 20^\circ 30' + 85^\circ 30' = 540^\circ$$

End of scheme

10M