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SCHEME OF VALUATION

Scoring Indicator

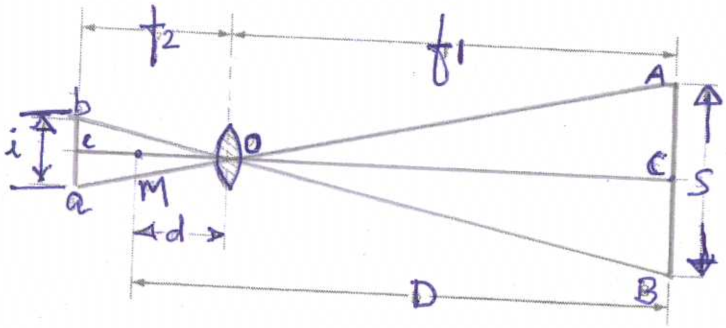
Revision : 2015 Course Code: 3012
Course Title: Surveying - II

Qst. No.	Scoring indicator	Split up score	Sub Total	Total
	PART A			
I(i)	Process of turning the telescope in vertical plane through 180^0 about the trunnion (horizontal) axis. -also known as plunging or reversing	2		
I(ii)	If a closed traverse is plotted according to the field measurements the end points will not coincide exactly with the starting point such an error is known as closing error.	2		
I(iii)	Tachometry – a) stadia system – fixed hair method and movable hair b) tangential system	1 1		
I(iv)	Length of curve : it is the total length of the curve from the point of commencement to the point of tangency.	2		
I(v)	EDM: Electro magnetic distance measurements done by Geodimeter, Tellurometer or Distomat	2	10	10
	PART B			
II(i)	(a) Right Swing: - process of turning the telescope in horizontal plane. - If the telescope is rotated in clock wise direction it is known as right swing - otherwise left swing.	2		
	(b) Face left : if the face of the vertical circle is to the left of the observer, the observations of the angle (vertical or horizontal) is known as face left observation.	2	6	
	(c) trunnion axis : horizontal or trunnion axis is the axis about which the telescope and the vertical circle rotate in the vertical plane.	2		
II(ii)	Uses of theodolite: 1. It is mainly used for laying of horizontal angle and vertical angle. 2. Locating points on line. 3. Prolonging a survey line. 4. Establishing grades. 5. Determining difference in elevation. 6. Setting out curves etc.	1 1 1 1 1 1	6	

II(iii)	Consecutive co-ordinate : The latitude and departure of any point w.r. to the preceding point are equal to the Latitude and departure of the line joining the preceding point to the point under consideration. Such co-ordinates are known as consecutive or dependent co-ordinates. Latitude, $L = l \cos \Theta$, departure, $D = l \sin \Theta$ (where l = length of the line and Θ = angle made between the line and the meridian line.	3		
	Independent co-ordinates : The total latitude and departure of any point w.r.t. a common origin are known independent co-ordinates or total co-ordinates of the point. Thus total latitude (or departure) of end point of a traverse = total latitudes (or departures) of the first point of the traverse plus the algebraic sum of all the latitudes (or departures).	3	6	
II(iv)	Steps involved in Gales traverse table: traverse computations are done usually in a tabular form.	1		
	1. Adjust the interior angles to satisfy the geometrical conditions, i. e. sum of interior angles to be equal to (2n – 4) right angles and exterior angles (2n + 4) right angles . In the case of compass traverse bearings are adjusted for local attraction if any.	1		
	2. Starting with the observed bearing of one line calculate the bearing of all other lines. Reduce all bearings into quadrantal system.	1 1		
	3. Calculate the consecutive co-ordinates i. e. latitudes and departures.			
	4. Calculate $\sum L$ and $\sum D$.	1		
	5. Apply necessary corrections to the latitudes and departures of lines so that $\sum L = 0$ and $\sum D = 0$. Corrections may be applied by transit rule or by compass rule upon the types of traverse.	1	6	
	6. Using the corrected consecutive co-ordinates calculate the independent co-ordinates to the points so that they are all positive, the whole of the traverse thus lying in the North East quadrant.			

II(v) Derive distance formula, $D = kS + C$ or $D = f/i \times S + (f + d)$

2



In the figure shown o is the optical centre of the objective of an ext. focussing telescope.

Let A, C, and B be the image of the cross wires at the staff.And b, c and a be the top, axial and bottom hairs of diaphragm.

$ab = i$ (stadia interval)

$AB = s$ (staff intercept)

f= focal length 2

$f1$ = horizontal distance, O C

$f2$ = horiz. O c.

d = OM

D = horizontal distance of staff from the vertical axis of the instrument.

M = centre of the instrument corresponding to the vertical axis.

Considering the similar triangles property from the figure,

$f1/f2 = s/i$

since f1 and f2 are conjugate focal distance

$1/f = 1/f1 + 1/f2$

Multiplying eqn (2) by ff1

$f1 = f + f1/f2 \times f$

substitute the value of eqn (1) in (3) we get 6

$f1 = f + f \times (S/i)$ 2

horizontal distance between the axis and the staff is

$D = f1 + d$

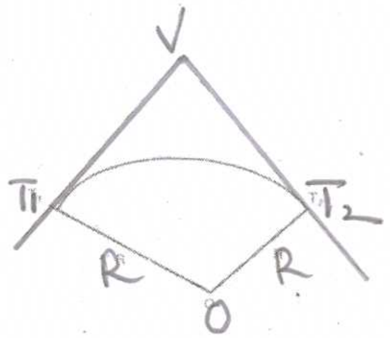
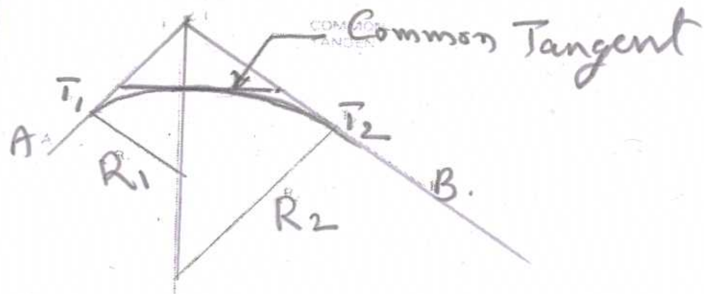
$D = f + f(S/i) + d$ …….rearranging the terms we get

$D = (f/i)S + (f + d)$

$D = kS + C$

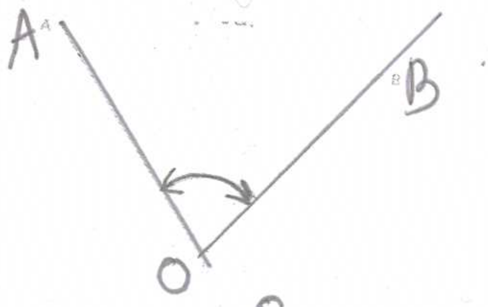
Where $k = f/i$ is known as multiplying constant and

$C = f + d$ is known as additive constant.

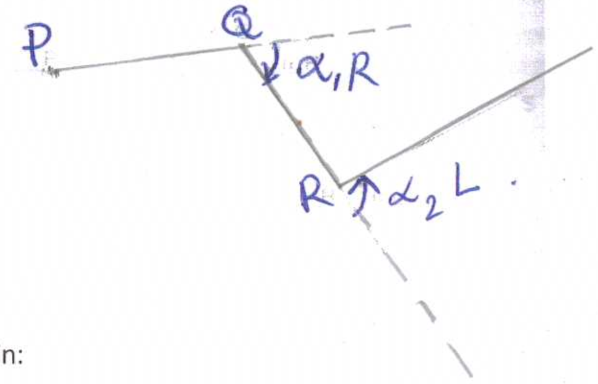
II(vi)	1. simple curve : The curve having a single arc of a circle connecting the two straights.  2. Compound curve: A curve which consists of two or more arcs of different circles with different radii having different centres lying on the same side of the common tangent and which bends in the same direction.  	3 3	6	
II(vii)	Applications of remote sensing : 1.forestry Resources can be easily identified and protected by the proper use of remote sensing data. • Monitoring large scale deforestation, forest fire etc. • Monitoring urban forestry. • Forest stock mapping and wild life habitat assessment 2.Agricultural use • early season estimation of total cropped area • Identification of crop and their coverage estimation in multi-cropped region. • crop yield modelling 3. Land use and soil 4. Geology : lithological and structural mapping mineral exploration and oil field detecting 5. Water resources: monitoring surface water bodies frequently and estimation of their spatial Extent. 6. Ocean resources. 7. Environmental impact study 8. Disasters: mapping flood inundated area and damage assessment.	1 1 1 1 1 1	6	~~30~~ 42

III (a)	PART C Fundamental lines : 1. The vertical axis. 2. Horizontal axis or trunnion axis 3. The line of collimation or line of sight 4. Axis of plate level 5. Axis of altitude level 6. Axis of striding level	3		
	Desired relations : 1. Axis of plate level must lie in a plane perpendicular to the vertical axis. 2. Line of collimation must be perpendicular to the horizontal axis at its intersection With the vertical axis. 3. Horizontal axis must be perpendicular to the vertical axis. If this condition exists the line of sight will generate a vertical plane when the telescope is plunged. 4. Axis of the altitude level (or telescope) must be parallel to line of collimation.If this condition exists, the vertical angle will be free from index error. 5. Vertical circle Vernier must read zero when the line of collimation is horizontal. If this condition exists , the vertical angle will be free from index error due to displacement of the Vernier. 6. Axis of striding level (if) must be parallel to the horizontal axis	5	8	
(b)	Temporary adjustment of a theodolite			
	1. Setting up : place the tripod over the station - legs of the tripod spread conveniently about 60^{0} with the horizontal and at a convenient hight and make it firmly on the ground.	2		
	2. Centering : is done to place the vertical axis exactly over the station mark. • Approximate centering is done by tripod legs -by moving it radially or circumferentially with help of plumb bob over the peg. • Exact centering is done by adjusting the shifting head.	2		
	3. Levelling up : accurate levelling is done by the plate bubble and the three footScrews.	2		
	The plate bubble is made parallel to any pair of foot screwsand bubble is brought in the centre by the inward or outward movement of the foot screws. • Then 3^{rd} foot screw is brought parallel to the plate bubble			

6

	and bring the bubble centre. • Repeat the process until bubble remains in the centre 4. Focussing : • focussing the eye piece. • focussing the objective	1	7	
IV (a)	Horizontal angle by repetition method 	1		
	• Theodolite is set up at ~~B~~ O and all temporary adjustments are done. • With face left adjust the Vernier reading A to zero so that reading on Vernier B will be 180^0 . • Release the lower clamp and rotate the telescope and bisect the left hand object A . tighten lower clamp and by lower tangent screw make fine bisection of A. • The upper clamp is loosened and telescope rotated in horizontal plane in clockwise direction until the object B is bisected. Tighten the upper clamp and make fine bisection of B point using upper tangent and note the Vernier reading on A and B.	2		
	• The lower clamp is now loosened and telescope turned in horizontal plane in clockwise direction till the left hand object A is again bisected……note the reading on A and B • (which should be same) as final reading in previous step above.	2	8	
	• Release the upper clamp and rotate the telescope in clockwise direction and bisect B again. Tighten the upper clamp and make the fine bisection using tangent screw. • Note the vernier A and B. • Above procedure is repeated till required number of repetitions are completed……if number of repetitions are three the final horizontal angle is obtained by final reading divided by number of repetitions i.e. three. • Now change the face and do the same with face right . • Mean horizontal angle is the mean of the above two faces.	3		

(b)	(a) Permanent Adjustment of Plate Level: 1. Set up the instrument on a firm and level ground and level it.	2		
	2. Loosen the clamp of both plates and turn the instrument in horizontal plane until the plate level tube is parallel to the pair of food screws. Bring the bubble to the centre of its run by these screws running both screws either in or Out.	1		
	3. Rotate the telescope abt the vert. axis until plate level tube is right angle to the original position. bring the bubble to the centre of its run by third foot screw.Now turn back to its original position and bring bubble to centre of its run by two foot Screws.	1		
	4. Repeat the above steps until the bubble remains central in both position.Keep the bubble in centre when the plate bubble is parallel to foot screws.If the bubble remains central the instrument is in adjustment. If not adjustIt as given below:	1	7	
	5. Correct half the error of the bubble by means of that pair of foot screws. Remaining half of the error adjust it by means of capstain headed screw fitted at one end of the plate level tube.	1		
	6. Repeat the procedure if necessary until the bubble central. Thus vertical axis of the instrument is made truly vertical.	1		
V (a)	(a) Deflection angle is the angle which a survey line makes with the prolongation of the receding line and it is right or left deflection according to its direction. Its angle ranges from 0 to 180 degree.	2		
	1. Set the instrument at Q and level it and both plates clamped at zero and take aback sight on P. 2. Plunge the telescope. Thus the line of sight is in the direction PQ produced when the reading on Vernier is A is zero.	2		
	3. Unclamp the upper clamp and turn the telescope clockwise to take a foresight on R.Read both the verniers . 4. Unclamp the lower clamp and turn the telescope to sight P again. Verniers still read the same reading as above.in step 3. Plunge the telescope.	2		
	5. Unclamp the upper clamp and turn the telescope to sight R. Read both verniers.Since deflection angle is doubled by taking both face readings, one half of the reading gives the deflection angle at Q.	2	8	



(b) Solutin:

Latitude of AB = 194.1 x cos 85.5 = + 15. 228
Departure of AB = 194.1 x sin 85.5 = + 193.50
Lat of BC = 201.1 x cos 15 = + 194.25
Dep of BC = 201.1 x sin 15 = + 52.15
Lat of CD = 165.4 x cos 74.5 = + 44.20
Dep of CD = 165.4 x sin 74.5 = - 159.38
Lat of DE = 172.6 x cos 15.5 = - 166.32
Dep of DE = 172.6 x sin 15.5 = - 46.13 — 7 — 7
∑ Latitude up to DE = + 87.358
∑ Departure up to DE = + 40.14
Latitude of EA = - 87.358
Departure of EA = - 40.14
Length of EA = $(\sqrt{(87.358^2 + (- 40.14)^{2)}})$ =96.1386m
TanΘ = departure of EA / Latitudeof EA — ~~1~~
= -4014 / -87.358 = 0.4594
Θ = 24^0 40''

~~VI (a)~~ VI (a)

Balancing : the term balancing is generally applied to the corrections to latitudes and Departures so that ∑ L = 0 and ∑D = 0 . This applies only when the survey forms a closed traverse. — 2

The Bowditch's rule is :
Correction to latitudes (or departures) of any side = Total error in latitude (or departure) X (Length of that side)/Perimeter of the traverse. — 3 — 7

Transit rule ;
Correction to latitude (or departure) of any side
= Total error in Lat (or Departure) x (latitude (or departure) of that line)/Arithmetic sum of latitudes (or departures). — 2

(b)

Co-ordinate method: - — ~~2~~

Line	Latitude	Departure	Station	Independent co-ordinaters	
				X	Y

AB	-157.2	+154.8	A	100	200
BC	+210.5	+52.5	B	254.8	42.8
CD	+175.4	-98.3	C	307.3	253.3
DA	-228.7	-109.0	D	209	428.7
			A	100	200

4 ~~2~~ 8

100 254.8 307.3 209 100

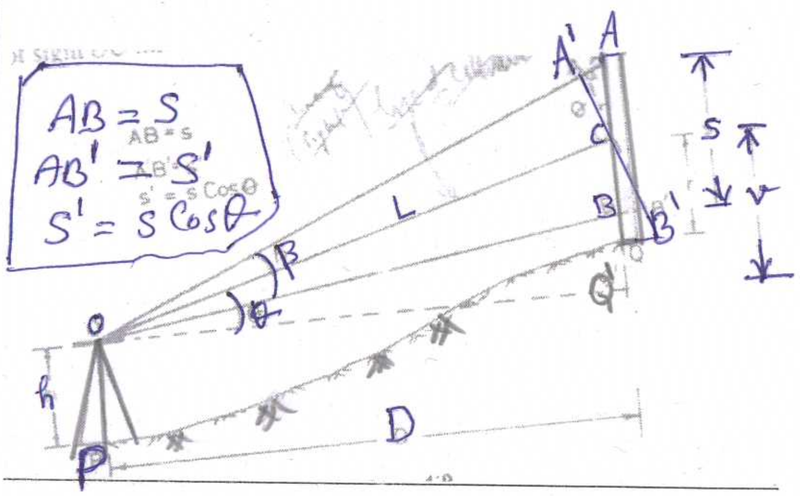
200 42.8 253.3 428.7 200

ΣP = 100 x 42.8 + 254.8 x 253.3 + 307.3 x 428.7 + 209 x 200 - (200 x 254.8 + 42.8 x 307.3 + 253 .3 x 209 + 428.7 x 100)
= 242360.35 – 159922.14
= 82438.21 2

~~VII~~ Area = 41219.105 m^2 2

~~(a)~~ ~~2~~

VII (a)



2

Refer in the fig. triangle AA'C, A'C = AC Cos Θ
C is the middle point of AB ~~2~~ 7

A'C= (AB/2) cos Θ

2 A'C = AB cos Θ

But 2 A'C = AB' Thereafter , A'B = AB cos Θ

S' = S cos Θ ~~2~~

The length L of inclined distance OC may be written as

L =KS^2+C

L = KS CosΘ

D = KS cos^{2}Θ 3

~~(b)~~ The vertical intercept V between the horizontal line OQ' through O and the point C is given by

V = CQ' = L sinΘ ~~3~~ ~~8~~

V = (Ks cosΘ + C) sin Θ

= (½)ks sin 2 Θ +C sinΘ 2

(b) Solution: 2

D = Ks cos^{2}Θ + 0.0

$= 100\,(1.351-0.645)\cos^2(4^0 30')$ — 2

$= 70.165$ m

V $= ½\,(ks)\sin 2\Theta + 0.0$ — 2

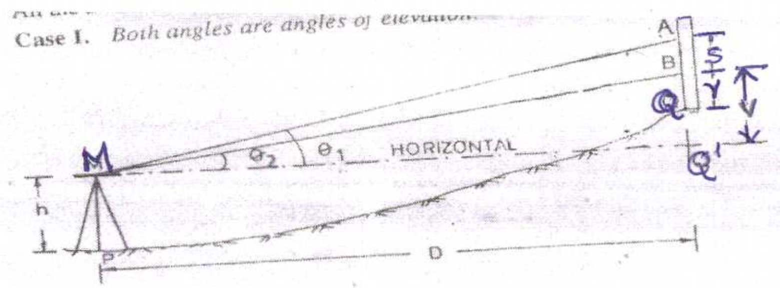
$= ½ \times 100 \times (1.351-0645)\sin 9^0$

$= 5.522$ m — 2

RL of Q $= (200.410+1.490)+5.522-0.998$

$= 206.424$ m

VIII (a) — ~~2~~



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2 — 7

From the triangle BMQ' V $= D\tan\Theta_2$ (a)

From the triangle AMQ', V $= V + \cancel{s}S = D\tan\Theta$ (b)

From Eqs. (a) and (b)

$S = \tan\Theta_2 - D\tan\Theta_2$ — 1

$$D = \frac{s}{\tan\Theta_2 - \tan\Theta_2} \quad (4.39)$$

$$D = \frac{s\cos\Theta_1\cos\Theta_2}{\sin(\Theta_1 - \Theta_2)} \quad (4.40)$$

$V = D\tan\Theta_2$ (4.41)

$$= \frac{s\cos\Theta_1\cos\Theta_2}{\sin(\Theta_1 - \Theta_2)} \times \frac{\sin\Theta_2}{\cos\Theta_1} \quad (4.40)$$ — 1

$$= \frac{s\cos\Theta_1\sin\Theta_2}{\sin(\Theta_1 - \Theta_2)} \times \frac{\sin\Theta_2}{\cos\Theta_1} \quad (4.42)$$ — 1

~~(b)~~

RL of Q = R L of instrument axis +V -r (4.44) — 3

(b) — 8

Elevation of the instrument axis at A

$= 178.450 + 2.850 = 181.30$ — 2

Elev. Of the instru. Axis at B

$= 178.450 + 3.580 = 182.03$ — 1

S $= 182.03 - 181.30 = 0.73$ m

$\alpha_1 = 30^0 45'$ and $\alpha_2 = 16^0 10'$

$$D = \frac{(d + s\cot\alpha_2)\tan\alpha_2}{(\tan\alpha_1 - \tan\alpha_2)}$$ — 2

$= 78.43$ m

Height of Q above the instru. Axis at A,

$h_1 = D\tan\alpha_1 = 46.66$ m

RL of Q = 181.300 +46.66 = 227.96

RL of foot of signal = 227.96- 5 = 222.96m — 3

X (a) UNIT 5

1. Tangent distance, T = R tan I/2* instead of I delta symbol or Q can be used. — 2

= 500 x tan 60 ^{0} /2

= 288.68 m

Length of curve, l = (∏ RI)/ 180

= 500 tan 60'/2 = 288.68 — 2 — 10

= (∏ RI)/ 180 = ∏ x 500 x 60/180 = 523.60m — 1

Chainage of T_1 = 1150.50-288.68 = 861.82 m

Chainage of T_2 = 861.82523.60 = 1385.42 m ½ — 2

Length of chord L = 2R sin I/2

= 500 m — 2

Degree of curve, D_a = 1718.87/R = 3 ^{0}44'

E = R(sec1/2-1) — 1

= 77.35m

M = R(1- cos I/2)

= 66.99 m

(b)

Components of GPS receiver –

- Antennas with preamplifier — 1
- RF section with signal identification and signal processing — 1
- Micro processor for receiver control data sampling and data processing — 1
- Precision oscillator — 1
- Power supply — 1 — 5
- User interface, command and display panel

X (a)

Solution: — ~~4~~ 4

mid odinite O_o = R-($\sqrt{R^2-(L/2)^2}$)

5 = R - R-($\sqrt{R^2-(100/2)^2}$)

There for R = 252.50 m — 2

Odinite, O_x = $\sqrt{R^2 - x^2}$-(R- O_O) , when x = 10

i.e O 10 m =√ (252.50)^2-X^2) –(252.50 5) — 10

= 4.802 m

Ordines are calculated for various values of x measured from the centre of the long chord as shown in the table — 4

X (m)	10	20	30	40	50
Oo (m)	4.802	4.207	3.211	1.812	0.0m

(b)

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