BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI

SURVEYING (CE F213)

Comprehensive Exam

(Close Book)

Date: 01/12/2016   Duration: 1 Hr. 30 min   Maximum Marks: 40

Time: 9 AM to 10.30 AM

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Note: All questions are compulsory

Q.1.

a) The following slope distance were measured along a chain line with a 30 m chain.

Slope distance	Angle of slope
28.7 m	5°
23.4 m	7°
20.9 m	10°
29.6 m	12°

It was noted afterward that the chain was 0.025 m too short. Find the true horizontal distance.

[2]

b) The following table gives the corrected latitude and departures (in meters) of the sides of a closed traverse ABCD. Compute its area by MD method; DMD method.

Line	Latitude		Departure	
	N	S	E	W
AB	108		4	
BC	15		249	
CD		123	4	
DA	0			257

[2]

c) A survey line was measured with a 20 m chain on a falling gradient of 1 in 8 and found to be 12.48 chains. Later however, it was found that the chain was 0.4 link too short. What length should the line scale on a plan? [2]

d) The following observations were made on Beaman stadia arc fitted on the vertical circle of a transit:

Staff reading (m) = 1.772, 2.565, 3.358

V-scale reading = 56

H-scale reading = 0.46

RL of the instrument station = 300 m

Calculate the horizontal distance and elevation of the staff station. [2]

e) Calculate the value of the constant 'c' for a vertical curve having upgrade 2.2% followed by a downgrade 1.8 % and the rate of change of grade is 0.04 % per 20 m chain. [2]

f) Calculate the length of vertical curve for the following given data;

Upgrade, g1 = + 1.5 %

Downgrade, g2 = - 1.0 %

Height of the driver's eye = 1.40 m

Height of the obstruction = 0.15 m

Minimum sight distance = 220 m [1]

Q.2. Find the corrected bearings of the following traverse taken from a compass survey.

Line	Fore Bearing	Back Bearing
AB	191°30′	13°00′
BC	69°30′	246°30′
CD	32°15′	210°30′
DE	262°45′	80°45′
EA	230°15′	53°00′

[5]

Q.3. The following observations were made in a tacheometric survey.

Inst. station	Height of axis	Staff station	Vertical angle	Hair readings (m)	Remark
A	1.345	BM	-5°30′	0.905, 1.455, 2.005	RL of BM = 450.500 m
A	1.345	B	+8°0′	0.755, 1.655, 2.555	
B	1.550	C	+10°0′	1.500, 2.250, 3.000	

Calculate the RL's of A, B, and C and the horizontal distance AB and BC. The tacheometer is fitted with an analectic lens and the multiplying constant is 100. [4]

Q.4. Explain with neat sketch, bad fix and good fix in plane table surveying particularly in a three-point problem. [2]

Q.5. What are the characteristics of contours? [4]

Q.6. Write a note on Electromagnetic distance measurement [4]

Q.7. Define surveying. What are the principles of surveying? Explain them briefly [3]

Q.8. Fill in the blanks [7]

1. The ……………….rule is particularly useful when angular measurements are more precise as compared to the linear measurements

2. ……………..is the longest main survey line on a fairly level ground and passing through the center of the area.

3. The method of reduction of levels which provides a full check on calculations of all sights, is known as…………………method.

4. Contour interval for a map on scale 1: 1,00,000 is ……………

5. The prismiodal formula usually yield a volume ………… than that obtained by end area formula.

6. ………………is an instrument used for locating points on a given contour gradients.

7. The size of theodolite is determined by the ………………………. of its telescope

8. The operation of revolving a plane table about its vertical axis so that all lines on the sheet becomes parallel to corresponding lines on the ground is known as ……………..

9. Fine adjustment in a theodolite is done by the ………….

10. ……………... remote sensing uses sun as a source of electromagnetic energy and records the energy that is naturally radiated and/or reflected from the object.

11. Since ……………and…………are completely absorbed by the atmosphere, these can not be registered with remote sensing technique.

12. The wavelengths at which EM radiations are partially or wholly transmitted through the atmosphere are known as ……………………and are used to acquire remote sensing data.

13. Total station can record angles with a resolution between………………..

14. Revolving the telescope in the horizontal plane, about its vertical axis is called ……………

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Note: All questions are compulsory

Q.1. Part of data and calculation in respect of a closed theodolite traverse ABCDA are as under:

Line	Length	RB	Northing	Southing	Easting	Westing
AB		S 60° E		30.00		
BC		N 45° E			49.50	
CD						
DA				51.65		63.15

Complete the above table in all respect if there is no closing error for the traverse.
[5]

Q. 2. A page of level book is reproduced below in which some readings are missing (marked by *). Find the RL's at each station and complete the table with all arithmetical checks. **[7]**

Station	BS	IS	FS	Rise	Fall	RL	REMARK
1	3.65						
2		*		2.75			
3		2.83					
4		3.64					
5	*		7.42				CP
6		12.41			7.32		
7		4.32					
8		3.00					
9		-6.17					Staff held inverted against ceiling
10	*		*		*	108.26	CP
11			*		1.32		
Σ	17.66				25.93		

Q. 3. For preparing a track for national games, following theodolite traverse was conducted

Side	Length (m)	Bearing
AB	592.65	20°

BC	501.47	85°
CD	455.88	140°
DE	410.29	190°
EF	501.57	245°
FA	638.24	310°

Calculate the minimum radius of the circular curves to be introduced at the traverse stations so that the length of the track is exactly 3000 m.
[6]

Q. 4. From a contour plan of a proposed reservoir area, the following data were found:

Contour (m)	155	160	165	170	175	180
Area (ha)	8	11	16	20	23	34

Determine
1. The capacity of the reservoir if the full reservoir level is 180 m.
2. The elevation of the water surface when the reservoir is at its half-capacity.

The volume below the contours of 155 may be ignored (use prismoidal formula).
[7]

Q. 5. It is proposed to connect the straights AB and CD by a composite reverse curve with the point of reverse curvature on BC. The points B and C are the intersection points of the tangents of the first and second circular curves, which have a common radius R meters. The transition curves are to be introduced at each end of the circular curves. Given the following total co-ordinates of A, B, C and D, and that the length of the transition curve is 4.472 $\sqrt{R}$ meters, Find the common radius of the circular curves. (Fig. 1)
[7]

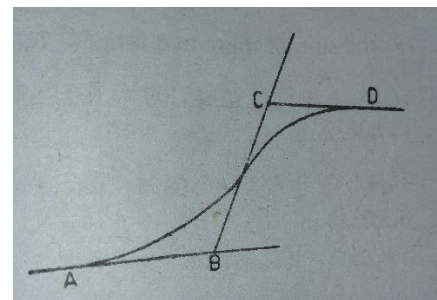| Point	Total latitude in meters	Total departure in meters
A	+ 711.6	+ 3309.6
B	+769.2	+ 3792.6
C	+ 1435.6	+ 4249. 6
D	+ 1448.6	+ 4691. 2

Fig. 1

Q. 6. Short question answer   **[8]**

a) How will you set up a perpendicular with the help of only chain and tape.
b) One month after the completion of a plane table survey, it is detected that one important object was not plotted. How will you plot the object on going to the field?
c) What is the relation between the line of collimation and the axis of a telescope?
d) What is the name of error in which magnitude is increasing (either positive or negative) with the increase in measured distance? Given any one example?
e) How will you continue levelling across a river?

f) State trapezoidal ' rule. What are the consideration and limitations of this rule.
g) How is the station marked on the ground?
h) The scale of map of plotting is 5 m = 1 cm and the allowable error is 0.02 cm. What is the nearest measurement that can be taken on ground?