

Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

	Course Title: SURVEYING - I		
	Credits (L:T:P) : 4:0:0	Total Contact Hours: 52	Course Code: 15CE21T
	Type of Course: Lectures, Self Study & Quiz	Credit : 04	Core/ Elective: Core

Prerequisites: Knowledge of Basic Science and Mathematics in Secondary Education.

Course Objective:

1. To provide knowledge of basic Principles of surveying.
2. To develop the techniques of taking measurements and plotting the details.
3. Interpretation of data collected analyze and evaluate for the purpose of design, estimation

Course Outcome:

On successful completion of the course, the student will be able to:

Course Outcome	
CO1	Apply the knowledge of mathematics in surveying
CO2	Understand the basic principles of surveying
CO3	Conduct the survey, interpret data collected and prepare the drawings.
CO4	Analyse the data from the drawing and estimate the quantities
CO5	Present the case study using survey techniques and engage in lifelong learning.

Mapping of COs with Pos

Mapping of COs with Pos		PROGRAMME OUTCOME											
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
Course Outcome	CO1	S	S										
	CO2	S	S				S						
	CO3	S	S	S	S		S	M	M	M		M	
	CO4	M	M	S	S		S		M	M		M	
	CO5	M	M	S	S	S	S	M	M	M	S	S	S

S: Strong Relationship

M: Moderate Relationship

Course Contents:

UNIT	COURSE CONTENTS	HOURS	WEIGHT AGE OF MARKS
1	INTRODUCTION Definition and objectives of surveying, primary divisions, classifications, and principle.	2	30
	CHAIN SURVEYING Purpose, Accessories, Principles of chain surveying, Different operations, Ranging, Cross staff survey, Plotting the chain survey, adopting suitable conventions, Errors&corrections in chain surveying, Simple problems	10	
2	COMPASS SURVEYING Introduction and purpose, Bearing & its type, Problems on bearings, Compass and its type, Dip and declination, Simple problems, Local attraction, Open and closed traverse, checks, Errors	10	30
3	LEVELLING – Terms used in levelling, types of levels, Bench marks, Temporary adjustments of level Concept of B.S, I.S, F.S, C.P, H.I and remarks, Simple levelling and differential levelling Reduction of levels i) Plane of collimation method ii) Rise and fall methods Problems on reduction of levels.	10	30
4	LEVELLING – APPLICATION Different types of levelling - fly levelling, check levelling, profile levelling, cross sectioning, Plotting of longitudinal and cross section, Errors in levelling and precautions, Setting grade stakes and setting out grades for sewers and problems on it.	10	30
5	CONTOURING Concepts of contour and terms used in contouring, characteristics of contour, uses of contours, Methods of contouring , Interpolation by arithmetical method, calculation of capacity of the reservoir .	05	15
6	AREAS & VOLUMES Computation of Area of Irregular figures using Trapezoidal & Simpson's rule - problems. Volumes of Irregular solids- using Trapezoidal & Prismoidal Rule - Problems on Embankment & Cutting	05	10
7	CASE STUDY		

Course Assessment and Evaluation Scheme:

	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment meth	CIE	IA	Students	Three tests (Average of three tests to be computed)	20	Blue books	1,2,3,4,5
				Case study	05	Reports	1 2 3 4,5
	SEE	End Exam		End of the course	100	Answer scripts at BTE	1,2,3,4,5
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1, 2,3,4,5 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3, 4,5 Effectiveness of Delivery of instructions & Assessment Methods

Questions for CIE and SEE will be designed to evaluate the various educational components such as:

1. Remembering and Understanding : - 30% weightage
2. Applying the knowledge acquired from the course : -30% weightage
3. Analysis : - 30% weightage
4. Evaluation : - 5% weightage
5. Creating new knowledge : - 5% weightage



TEXT BOOKS

1. Surveying and Levelling Vol- I & II by B C Punmia
2. Surveying and Levelling by T P konetkar & S V Kulkarni
3. Plane Surveying by Dr. Alak De
4. Surveying and Levelling by S SBhavikatti
5. Surveying by Duggal
6. Surveying by R Agor
7. Fundamentals of Surveying by S K Roy
8. Surveying and Levelling by N NBasak

E-links

1. www.elearning.com/survey
2. <http://nptel.ac.in/video.php?subjectId=105104101>
3. <http://media.sakshat.ac.in/NPTEL-IIT-Videos/>
4. http://nptel.iitk.ac.in/courses/Civil_Eng/IIT%20Roorkee/Surveying.htm
5. <http://nptel.iitk.ac.in/>

Model question paper

Code: **15CE21T**

Second Semester Diploma Examination

SURVEYING-I

Time: **3 hours**]

[**Max. Marks: 100**

- Note:** 1. Answer any **SIX** questions from **Section-I**, Each question carries **5** marks
2. Answer any **SEVEN** questions from **Section-II**, Each question carries **10** marks

SECTION- I

1. Define surveying. State the objects of surveying.
2. With a neat sketch, explain stepping method of chaining on Sloping Ground.
3. Compare Prismatic compass with surveyors compass
4. At a place the bearing of sun is measured at local noon and found to be $175^{\circ} 15'$. What is the magnitude and direction of magnetic declination of the place?
5. Define the following terms
i) Level line ii) Parallax iii) change point
6. Explain the temporary adjustments of a Dumpy level
7. What are the uses of taking L/S & C/S?
8. What are the different sources of errors in levelling?
9. What is Contour interval? List the factors affecting it.

SECTION- II

1. a) What is Reconnaissance survey and state its importance?
b) Differentiate between Check line and Tie line?
2. a) What is Cross staff survey? Mention its applications?
b) A 30m chain was found to be 10cm too long after chaining 1000m. Again chain was found to be 15cm too long after chaining another 500m. If the chain was correct before commencement of the work, find the true distance.
3. a) Compare WCB system and R.B. system.
b) Convert the following W.C.B to R.B

i) 10° ii) $45^{\circ}15'$ iii) $135^{\circ}45'$ iv) $315^{\circ}15'$ v) $215^{\circ}15'$

4. The following bearings were observed in running a closed traverse.

Line	Fore bearing	Back bearing
AB	$75^{\circ}05'$	$254^{\circ}20'$
BC	$115^{\circ}20'$	$296^{\circ}35'$
CD	$165^{\circ}35'$	$345^{\circ}35'$
DE	$224^{\circ}50'$	$44^{\circ}05'$
EA	$304^{\circ}50'$	$125^{\circ}05'$

At what station do you suspect local attraction? Determine the corrected bearings

5. Explain the special methods of spirit levelling.
6. a) Compare Rise & fall Method with Collimation method.
- b) What are the different sources of errors in levelling?
7. In running Fly levels from a BM. Of RL. 384.705m the following readings were obtained :

BS: 3.215, 1.030, 1.295, 1.855

FS: 1.225, 3.290, 2.085

From the last position of the instrument, Six pegs at 25.00m intervals are to be set out on a uniformly falling gradient of 1 in 100, the first peg is to have RL of 384.500m. Work out the staff readings required for setting the top of the pegs on the given gradient.

8. Four sight rails are to be erected over points A,B,C and D 50m apart in a straight line. The invert level of sewer at d is 74.500m. The sewer is on a gradient of 1 in 200 rising from D to A. The RL of pegs on the surface of ground are 76.300, 75.500, 74.850, and 75.650 respectively from A to D. The height of sight rail at d is 1.5m. find the suitable height of the boning rod and height of the sight rail above the pegs at A, B, and C
9. a) Mention any three uses of contour.
- b) The areas within the contour lines at the site of reservoir and face of the proposed dam are as follows.

Contour (m)	Area (m^2)
100	1000
103	128000
106	16600
109	18800
112	24400
115	30600
118	38400

If 100.00m is the bottom level and 118.00m is the maximum water level of the reservoir, calculate the capacity of reservoir using trapezoidal formula and Prismoidal formula.

10. A road of constant RL 120.00m runs from North to South. The GL along the centre line of the road are as follows:

Chainage	R.L.
0	117.50
30	116.25
60	115.95

90	116.65
120	117.20
150	117.85
180	115.70

Assuming no transverse slope, find the volume of earth work for a road of formation width 8.00m with side slopes 1.5 :1 by;

- i) Trapezoidal method ii) Prismoidal method

MODEL QUESTION BANK

Code: **15CE21T**

Second Semester Diploma Examination

SURVEYING-I

1. Define surveying. State the objects of surveying
2. List the Principle of survey.
3. What are the uses of Survey
4. What is reconnaissance survey? State its importance in surveying.
5. Explain the following terms : a) Base line b) Check line c) Tie line
6. Explain with neat sketch indirect ranging
7. List the different methods of dropping perpendicular to a chainline. Explain any one
8. Briefly explain the classification of surveying based on the objects of survey
9. Differentiate between Check line and Tie line
10. State the use of Chain / tape, ranging rod, Peg, Arrows in chaining process.
11. Define Base line, Tie line and state their significance in chain Triangulation.
12. State the Procedure of setting Offsets with open cross staff.
13. What is Cross staff survey? Mention its applications
14. What are the cumulative and Compensating errors in chain survey
15. A 30m chain was found to be 10cm too long after chaining 1000m. Again chain was found to be 15cm too long after chaining another 500m. If the chain was correct before commencement of the work, find the true distance.
16. Plot the following details of a field and calculate the area, all measurements being taken in metres.
17. Write the conventional signs for plotting survey works.
18. Briefly explain any five errors in chaining.
19. Explain the temporary adjustments of Compass.
20. Explain prismatic compass with a neat sketch
21. Explain i) True Bearing and Magnetic bearing ii) Dip and Declination
22. Compare Prismatic compass with surveyors compass
23. Differentiate between i) fore bearing and back bearing ii) closed traverse and open traverse
24. Convert the following fore bearing to Back. Bearing
a) $125^{\circ} 15'$ b) $N30^{\circ} E$ c) 360° d) $S45^{\circ} 45'W$ e) $N 25^{\circ} 45'E$

Compare WCB system and R.B. systems

25. Convert the following W.C.B to R.B
i) 10° ii) $45^{\circ} 15'$ iii) $135^{\circ} 45'$ iv) $315^{\circ} 15'$ v) $215^{\circ} 15'$
26. Convert the following RB to WCB
i) N $30^{\circ} 15'$ W ii) N $45^{\circ} 45'$ E iii) S $15^{\circ} 15'$ W iv) S $25^{\circ} 15'$ E
27. State any four instrumental and personnel errors in prismatic compass survey.
28. What is meant by local attraction? How it is detected and eliminated?
29. The following bearings were observed in running a closed traverse.

Line	Fore bearing	Back bearing
AB	$75^{\circ} 05'$	$254^{\circ} 20'$
BC	$115^{\circ} 20'$	$296^{\circ} 35'$
CD	$165^{\circ} 35'$	$345^{\circ} 35'$
DE	$224^{\circ} 50'$	$44^{\circ} 05'$
EA	$304^{\circ} 50'$	$125^{\circ} 05'$

At what station do you suspect the local attraction? Determine the corrected bearings

30. The following bearings were observed with compass. Calculate the interior angles.

Line	Fore bearing	Back bearing
AB	$60^{\circ} 30'$	$240^{\circ} 30'$
BC	$122^{\circ} 0'$	$302^{\circ} 0'$
CD	$46^{\circ} 0'$	$226^{\circ} 0'$
DE	$205^{\circ} 30'$	$25^{\circ} 30'$
EA	$300^{\circ} 0'$	$120^{\circ} 0'$

31. What are the sources of errors in compass survey and what precautions will you take to eliminate them
32. At a place the bearing of sun is measured at local noon and found to be $175^{\circ} 15'$. What is the magnitude and direction of magnetic declination of the place?
33. In an old survey made when the declination was $4^{\circ}W$, the magnetic bearing of a given line was 210° . The declination in the same locality is now $10^{\circ}E$. What is the true and present magnetic bearing of the line?
34. Define the following terms used levelling
i) Level surface ii) level line iii) datum iv) elevation v) mean sea level vi) bench mark vii) station viii) HI ix) BS, IS, FS x) change point xi) parallax xii) line of collimation xiii) Axis of telescope
35. Explain the temporary adjustments of a dumpy level?
36. What are the different types of levelling staff?
37. Comparison of HI method & Rise & Fall method of computing the levels?
38. Explain the special methods of spirit levelling.
39. What are the uses of taking L/S & C/S?
40. During the fly levelling operation the following observations were made :
Back sight: 0.650, 2.155, 1.405, 2.655, 2.435

Fore sight: 2.455, 1.305, 0.5555, 2.405

The first back sight was taken on a BM of RL 100.500m. From the last back sight it is required to set four pegs each at a distance of 30m on a falling gradient of 1 in 100. Calculate the RL of these four pegs. Apply the check.

41. Four sight rails are to be erected over points A, B, C and D 50m apart in a straight line. The invert level of sewer at d is 74.500m. The sewer is on a gradient of 1 in 200 rising from D to A. The RL of pegs on the surface of ground are 76.300, 75.500, 74.850, and 75.650 respectively from a to D. The height of sight rail at d is 1.5m. find the suitable height of the boning rod and height of the sight rail above the pegs at A, B, and C
42. The following consecutive readings were taken with a dumpy level: 0.875, 1.235, 2.310, 1.385, 2.930, 3.125, 4.125, 0.120, 1.875, 2.030, 3.765. The first reading was taken with the staff held upon a BM of elevation 132.135. Enter the readings in level book form and reduce the levels. Apply the usual checks. Find also the difference in level between the first and the last points.
43. Calculate the reduce level by Rise and Fall method on a continuous sloping ground with four meter levelling staff at common interval of 30m.
0.855(onA),1.545,2.335,3.115,3.825,0.455,1.380,2.055,2.855,3.455,0.585,1.015, 1.850, 2.755,3.845 (on B);The reduced level of A was 380.500. Make the entries in a level book and apply usual checks. Determine the gradient of AB
44. Compare the Rise and fall method of reducing levels with the height of collimation method
45. What are the different sources of errors in levelling? How are they eliminated?
46. What is Contour? What are the uses of Contour maps?
47. Explain the characteristics of contours with sketches
48. What is Contour interval? List the factors affecting it.
49. Mention the methods of locating Contours. Explain the method of locating contour by cross-sections
50. What is interpolation of contours? Explain arithmetical method of interpolating contours
51. The areas within the contour lines at the site of reservoir and face of the proposed dam are as follows.

Contour (m)	Area (m ²)
100	1000
103	128000
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line of the road are as follows:

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Assuming no transverse slope, find the volume of earth work for a road of formation width 8.00m with side slopes 1.5 :1 by;

- ii) Trapezoidal method
- iii) Prismoidal method