GUJARAT TECHNOLOGICAL UNIVERSITY

2nd Semester Civil Engineering – PDDC

Subject Code & Name : X20601 - Advanced Surveying

Sr. No.	Course content
1.	**Tacheometric surveying :** Stadia system, Fixed and Movable hair methods, Staff held vertical and normal, instrument constant, Analytic lens, Tangential system, Direct reading tacheometer, Subtense bar.
2.	**Curves- Types of Curves :** Elements of a curve, Simple curve, Different methods of setting out of a curve, Introduction to compound, reverse, transition and vertical curves.
3.	**Hydrographic survey :** Shoreline and river survey, Soundings Methods, equipment and ranges- Locating sounding- Plotting- Three point problem.
4.	**Photogrammetry :** Classification of photogrammetry, Photogrammetric Process, Acquisition of Imagery and its Support of data, Stereoscopic 3D viewing and measurement.
5.	**Modern Surveying Instruments :** Introduction, Electromagnetic spectrum, Electromagnetic distance measurement, Total station.
6.	**Astronomy :** Definitions-Celestial coordinate system, Sidereal Time, Apparent Solar Time, Mean Solar Time, Standard Time, Equation of Time.
7.	**Remote Sensing :** Introduction, Principles of energy interaction in atmosphere and earth surface features, Image interpretation techniques, visual interpretation, Digital image processing, Global Positioning system
8.	**Geographical Information System :** Definition of GIS, Key Components of GIS, Functions of GIS, Spatial data, Geospatial analysis, Integration of Remote sensing and GIS and Applications in Civil Engineering.

TERM WORK : Term work should be based on the above topic and should include project on tachometry and curve setting practice

References Books :

1. Arora, K.R., Surveying, Volume I,II &III Standard Book House, New Delhi
2. Duggal, S.K., Surveying, Volume I and II, 2nd Edition, Tata McGraw Hill Publishing Company Ltd., New Delhi
3. Kanetkar, T.P. and Kulkarni, S.V., Surveying and Levelling, Volume – I & II, Pune Vidyarthi Griha Prakhashan, Pune
4. Punmia, B.C., Surveying, Volume-I, II & III Laxmi Publications, New Delhi
5. Bhatia, B., Remote Sensing and GIS, Oxford University Press, New Delhi.
6. Kanetkar, T.P. and Kulkarni, S.V., Surveying and Levelling, Volume – I & II, Pune Vidyarthi Griha Prakhashan, Pune
7. Lillesand, T.M. Kiefer, R.W. and Chipman, J.W., Remote sensing and Image Interpretation, 5th edition, John Wiley and Sons India
8. Patel, A.N. and Singh, S., Remote Sensing Principles and Applications, Jodhpur

Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–II • EXAMINATION – WINTER 2013

Subject Code: X20601 Date: 20-12-2013

Subject Name: Advance Surveying

Time: 02.30 pm - 05.00 pm Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** What is tacheometry? Write its uses. **07**

(b) Describe the method of determining the constants of a tacheometer from field measurements. **07**

Q.2 **(a)** Explain the various sources of errors in tacheometry. **07**

(b) A tacheometer having constants 100 and 0.15 is set at X. The RL of Bench Mark is 350 meter. Followings are the readings obtained on a staff vertically held. Determine the distance between XY and RL of Y. **07**

Instrument station	staff point	Vertical angle	Staff Readings in meter.		
			Bottom	Center	Top
X	B.M.	-6^0	1.300	2.000	2.690
	Y	$+ 8^0$	0.900	1.700	2.500

OR

(b) Explain the various types of curve with neat sketch. **07**

Q.3 **(a)** Explain the elements of circular curve with neat sketch. **07**

(b) Describe briefly the location of sounding stations by means of (a) Cross rope soundings and (b) Intersecting ranges. **07**

OR

Q.3 **(a)** Explain the principle and objectives of photogrammetry. **07**

(b) Define: - Flight line, Azimuth, Swing, Tilted photographs, Exposure station, Principal line, Relief displacement. **07**

Q.4 **(a)** What are the advantages of EDM instruments? **07**

(b) Discuss electromagnetic spectrum with neat sketch. **07**

OR

Q.4 **(a)** Explain the following terms: **07**

(i) Departure (ii) Shortest Distance

(iii) Zenith (iv) Spherical triangle

Q.4 **(b)** Enlist the methods of determining Azimuth. Explain any one method. **07**

Q.5 **(a)** Explain components of Remote Sensing. **07**

(b) What is GPS? How it is useful in ground truth verification? **07**

OR

Q.5 **(a)** Define Geographical Information System. Explain the objectives of GIS. **07**

(b) Explain types of data in GIS software. **07**

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GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER–II • EXAMINATION – SUMMER 2013

Subject Code: X20601 **Date: 06-06-2013**

Subject Name: ADVANCE SURVEYING

Time: 02.30 pm - 05.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Describe the method of determining the constants of Tacheometer from field measurements. **07**

(b) Tacheometer was setup on the line joining stations A and B. Following reading were obtained on a staff held vertically at a point A and B. **07**

Instrument station	Staff station	Vertical angle	Staff reading	Remarks
P	A	+ 8˚ 24'	2.225, 2.605, 2.985	R L of A is 150 m
	B	- 1˚ 06'	1.640, 1.920, 2.200	

Calculate the horizontal distance between point A and B and R L of B when the constant of instruments are 100 and 0.00.

Q.2 **(a)** What are the different types of curves ? Draw neat sketch of each. **07**

(b) Two tangents intersect at a chainage of 1000 m, the angle of deflection being 30˚. Calculate all the necessary data for setting out a circular curve of radius 200 m by a peg interval of 20 m. **07**

OR

(b) Two tangents intersect at a chainage of 1320.5 m. The deflection angle being 24˚. Calculate the following quantities for setting out a curve of radius 275 m. **07**

(i) Tangent length
(ii) Length of long chord
(iii) Length of the Curve
(iv) Chainage of point of tangency
(v) Apex distance
(vi) Versed sine of curve

Q.3 **(a)** Define Hydrographic survey and write it's uses. **5**

(b) Enlist the equipments used for hydrographic survey. **5**

(c) Write advantages of echo sounding. **4**

OR

Q.3 **(a)** Define **07**

(i) Overlap
(ii) Side lap
(iii) Principal point
(iv) Isocenter
(v) Tilt

(b) Two points A and B on the ground appear in vertical photo as a and b taken from an aerial camera, having focal length of 16 cm and flying height (H) of 5000 m. The photo co ordinates of a and b are as follow. **07**

	Photograph co ordinates	
	x	y
a	- 2.0 cm	+ 2.65 cm
b	+ 2.18 cm	+ 1.30 cm

The height of points A and B is 160 m and 180 m respectively. Calculate the ground distance of point A and B.

Q.4 **(a)** Enlist the different types of EDM instruments and explain briefly the salient features of " Total station". **07**

(b) What are the properties of electromagnetic waves ? Draw complete electromagnetic spectrum showing all wave length. **07**

OR

Q.4 **(a)** Define **07**

(i) Zenith
(ii) Nadir
(iii) Vertical circle
(iv) Prime vertical
(v) Observer's meridian
(vi) Circumpolar star
(vii) Celestial circle

Q.4 **(b)** Calculate the sun's hour angle (H) and azimuth (A) at sunrise for a place in latitude 26° when it's declination is 18° N. **07**

Q.5 **(a)** Define Remote sensing and explain principle of remote sensing with sketch. **07**

(b) Classify the sensors and explain briefly each of them. **07**

OR

Q.5 **(a)** Define GIS and write the key components of GIS with it's functions. **07**

(b) Explain types of data in GIS and also write sources of data. **07**

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GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER – II • EXAMINATION – WINTER 2012

Subject code: X 20601 **Date: 16/01/2013**

Subject Name: Advanced Surveying

Time: 10.30 am - 01.00 pm **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	Discuss instruments used in tacheometry.	**07**
	(b)	What are the different errors in tacheometry? What are the permissible errors?	**07**
Q.2	**(a)**	A Staff was held vertically at a distance of 50 m and 100 m from the centre of a theodolite fitted with stadia hairs and the staff intercepts with the telescope horizontal were 0.5 and 1 m respectively. The instrument was set over the station A f RL is 1050.50 m and the height of instrument was 1.45 m. The stadia hair readings of a staff held vertically at a station B were 1.000, 1.850 and 2.7000 m while the vertical angle was -9^0 20'. Find the distance AB and RL of B.	**07**
	(b)	Write a short note on "Anallatic lens"	**07**
		OR	
	(b)	Explain the elements of simple circular curve with neat sketch.	**07**
Q.3	**(a)**	What are the objectives of field astronomy? Explain	**07**
	(b)	Explain – Zenith, Nadir, Celestial Poles, Vertical Circle	**07**
		OR	
Q.3	**(a)**	What are the purposes of Total Station?	**07**
	(b)	What are the advantages of EDM instruments?	**07**
Q.4	**(a)**	Explain the terms of photogrammetry: (i) Tilt (ii) Exposure station (iii) Principal Plane (iv) Azimuth (v) Swing	**07**
	(b)	Explain the components of Remote Sensing?	**07**
		OR	
Q.4	**(a)**	Define remote sensing. Explain principle of remote sensing.	**07**
	(b)	Explain the field application of GIS.	**07**
Q.5	**(a)**	Explain key components of GIS.	**07**
	(b)	Write a short note on "Transition Curve"	**07**
		OR	
Q.5	**(a)**	Enlist the methods of sounding. Explain any one in detail.	**07**
	(b)	Differentiate between Fixed hair method & Movable hair method.	**07**

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GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC SEM-II Examination May 2012

Subject code: X20601

Subject Name: Advanced Surveying

Date: 23/05/2012 **Time: 10.30 am – 01.00 pm**

Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** What are the different systems of tacheometric measurements? Derive the formula by tangential method when both the angles are angles of elevation. **07**

(b) Explain the principle of stadia method. **07**

Q.2 **(a)** Determine the gradient from a point A to B from the following observation made with a tacheometer fitted with an analectic lens. The constant of the instrument was 100 and staff was held vertically. **07**

Inst.St	Satff Pt.	Bearing	Verticle angle	Staff Reading
P	A	135^0	$+10^0 30'$	1.360,1.915,2.470
	B	225^0	$+5^0 30'$	1.065,1.885,2.705

(b) Two straight lines intersect at chainage of 1200 and the angle of deflection is 60^0. If the radius of curve is 500m, determine the following: **07**
(1)Tangent length (2) Length of curve (3) Chainage of points of curvature and tangency (4) Degree of Curve (5) Apex distance (6) Mid Ordinate

OR

(b) Explain the Rankine's mthod for setting out simple circular curve. **07**

Q.3 **(a)** Enumerate the instruments used in sounding. Explain Sounding Machine. **07**

(b) What is hydrographic surveying? What are the uses of hydrographic surveying? **07**

OR

Q.3 **(a)** What is transition curve? What are the advantages of transition curve? **07**

(b) Give classification of curves? And Explain vertical curves. **07**

Q.4 **(a)** Explain different stages of Idealized Remote Sensing system. **07**

(b) What is remote sensing? What are the uses of remote sensing? **07**

OR

Q.4 **(a)** A vertical photograph was taken at an altitude of 1500m above MSL. Determine the scale of photograph for terrain laying at an elevation of 100m and 400m if the focal length of camera is 15cm. **07**

(b) Write a short note on Electro Magnetic Spectrum with neat sketch. **07**

Q.5 **(a)** Enlist and explain key components of GIS. **07**

(b) Explain types of Data in GIS **07**

OR

Q.5 **(a)** Define the following terms: (1)The Zenith and The Nadir **07**
(2) The Azimuth (3) The hour angle (4) Local Sidereal Time (5) The visible Horizon (6) The celestial Sphere (7) The Latitude

(b) (1)Write a short note on parallax bar **07**
(2)Explain Relief Displacement.

Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC SEM-II Examination-Dec-2011

Subject code: X20601 **Date: 22/12/2011**

Subject Name: Advance Surveying

Time: 10.30 am -1.00 pm **Total marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	A tacheometer is set up at a station A and readings taken on a vertically held staff at B were 2.255, 2.605 and 2.955, the line of sight being at an inclination of $+9^0 26'$.Another observation on the vertically held staff at BM. gave readings 1.640,1.920,and 2.200, the inclination of line of sight $+2^0 10'$.Calulate the horizontal distance between A and B, and the elevation of B if RL of BM. Is 415.525m.The constants of instruments were 100 and 0.	**07**
	(b)	Enlist different Methods of Tacheometric Measurement And Explain any one of them	**07**
Q.2	**(a)**	Explain the Rankine's method of tangential angle for setting out simple circular curve	**07**
	(b)	Two straight lines intersect at chainage of 1200.50 m.and angle of deflection is 60^0.if the radius of curve is 500m determine the following (1)Tangent Distance(2)Length of curve(3)Length of long chord(4)Degree of curve(5)Apex Distance(6)Mid Ordinate	**07**
		OR	
	(b)	Give Classification of curves with neat sketches	**07**
Q.3	**(a)**	Enlist different equipments used for sounding and explain Lead line in detail.	**07**
	(b)	Explain the three point problem for plotting sounding	**07**
		OR	
Q.3	**(a)**	Write purposes of hydrographic surveying	**07**
	(b)	Explain the different components of simple circular curve with neat sketch.	**07**
Q.4	**(a)**	Define aerial and terrestrial photogrammetric surveying and explain the basic principle of terrestrial photogrammetry	**07**
	(b)	A vertical photograph was taken at an altitude of 1200 m above mean sea level. Determine the scale of photograph for terrain lying at elevation of 80 m and 300 m if the focal length of camera is 15 cm	**07**
		OR	
Q.4	**(a)**	Write a short note on Total station	**07**
	(b)	Explain the electro magnetic spectrum with neat sketch	**07**
Q.5	**(a)**	What are the different stages of Idealized Remote sensing system	**07**
	(b)	Explain the key components of GIS	**07**
		OR	
Q.5	**(a)**	Write a short note on local sidereal time	**07**
	(b)	Define the following terms (1)Azimuth (2)hour Angle(3)Celestial Sphere(4)Zenith and Nadir(5)Observer's meridian(6)visible horizon(7)vertical circle	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC 2ND Semester Examination – July- 2011

Subject code: X20601

Subject Name: Advanced surveying

Date:13/07/2011 **Time: 10:30 am – 01:00 pm**

Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Derive the expressions for horizontal and vertical distances in the fixed hair method when that staff is held vertically and the measured angle is that of elevation **07**

(b) To determine the distance between to stations A and B, a tachometer was setup at a point P on the line AB and the observations were recorded on a staff held vertical. **07**

Instrument station	Staff station	Vertical angle	Staff reading	Remarks
P	A	$+10^0 30'$	2.000 2.405 2.825	RL of A is 50m.
	B	$-2^0 5'$	1.655 1.950 2.255	

Q.2 **(a)** Explain Tacheometer and its constants **07**

(b) Following reading were taken with a tacheometer on to a vertical staff. Calculate the tacheometor constants. **07**

Horizontal distances	Stadia readings
52.400m	1.200, 1.465, 1.680
65.200m.	1.860, 2.165, 2.470

OR

(b) Explain briefly the salient features of total station. **07**

Q.3 **(a)** Explain meaning of triangulation survey. How will you select base line and triangulation station? Also define strength of figure. **07**

(b) Two station A and B are 80km. apart having 225m. and 550m. altitude respectively. The intervening obstruction situated at C, 40km. from A has a elevation of 285m. Ascertain if A and B are intervisible and if necessary find by how much B should be raised so that the line of sight must nowhere be less than 3m. above the ground surface. **07**

OR

Q.3 **(a)** Define (i) Systematic error (ii) Weight of an observed quantity (iii) True value a quantity (iv) Mistake **07**

(b) Calculate the most probable vales of the angles of a triangle ABC from the following observation **07**

Angle A = 65^0 15' 12" Weight – 2

Angle B = 65^0 20' 00" Weight – 3

Angle C = 49^0 30' 15" Weight - 4

Q.4 **(a)** What is tilt distention? Prove that in a tilt photo graph, tilt distention is radial from the isocentre. **07**

(b) A line AB appears to be 10.16cm. on a photograph for which the focal length is 16cm. The corresponding line measures 2.54cm of map which is to a scale 1:50000. The terrain has an average elevation of 200m. above mean sea level. Calculate the flying height of the aircraft above mean sea level. **07**

OR

Q.4 **(a)** Explain following Astronomical terms **07**

(i) Zenith and Nadir (ii) The hour angle

(iii) Vertical circle (iv) The azimuth

(b) Determine the hour angle and declination of a star from the following observation. **07**

(i) Altitude of a star = 22° 36”

(ii) Azimuth of a star = 42° W

(iii) Latitude of a place = 40° N

Q.5 **(a)** What are the key components of GIS ? Write functions of GIS **07**

(b) Describe the various applications of Remote Sensing and GIS in the field of civil engineering. **07**

OR

Q.5 **(a)** What is Remote sensing ? Differentiate between Active and Passive remote sensing. **07**

(b) Explain various methods of interaction of EM radiation with matter. What is the effect of EM radiation of the earth surface ? **07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

P.D.D.C. Sem- II Remedial Examination Nov / Dec. 2010

Subject code: X20601 **Subject Name: Surveying**

Date: 29 / 11/ 2010 **Time: 10.30 am – 01.00 pm**

Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Derive the following tacheometric equations for inclined, elevated sight and staff vertical. **07**

1. $D = ks\cos^2\theta + c\cos\theta$
2. $V = \frac{ks\sin 2\theta}{2} + c\sin\theta$ with usual notations

(b) A tacheometer was set up at a station A and the following readings were obtained on a vertically held staff. Calculate the horizontal distance from A to B and RL of B if the constants of the instrument were 100 and 0.4 **07**

Station	Staff station	Vertical angle	Hair readings	Remarks
A	B.M.	-2° 18'	3.225,3.550, 3.875	RL of BM = 437.655m
	B	+ 8° 36'	1.650, 2.515, 3.380	

Q.2 **(a)** Draw a neat sketch of simple circular curve. Define Point of curve, Point of tangency, Point of inter-section and long chord. Show the above components on the sketch drawn. **07**

(b) Enlist different methods for setting out simple curves and explain successive bisection of arcs with neat sketch. **07**

OR

(b) Define Compound curve, Reverse curve and Transition curve and state the situations in which these curves are introduced. **07**

Q.3 **(a)** What do you understand by sounding? What are the purposes of sounding? Enlist the equipment needed for sounding and explain any one in brief. **07**

(b) Enlist the methods of locating sounding and explain cross-rope method in detail. **07**

OR

Q.3 **(a)** Write a detailed note on the Three Point Problem with reference to hydro-graphic survey. **07**

(b) A, B and C are three visible stations in a hydrographical survey. The computed sides of the triangle ABC are: AB=1130m, BC=1372m and CA=1889m. Outside this triangle (and nearer to AC), a station P is established and its position is to be found by three point resection on A, B and C, the angles APB and BPC being respectively 42°35' and 54°20'. Determine the distances PA and PC **07**

Q.4	**(a)**	Classify photogrammetry and explain stereoscopic vision in brief.	**07**
	(b)	The scale of an aerial photograph is 1cm = 100m. The photograph size is 20cm x 20cm. Determine the number of photographs required to cover an area of 100 sqkm, if the longitudinal lap is 60% and the side lap is 30%.	**07**

OR

Q.4	**(a)**	Compare conventional Theodolite and Total Station mentioning their merits and demerits.	**07**
	(b)	Enlist the types of EDM instruments and explain any one type in detail.	**07**

Q.5	**(a)**	Define the following terms: 1. Zenith and Nadir 2. Mean solar time 3. Sidereal time 4. Standard time 5. Apparent solar time 6. Celestial Sphere	**07**
	(b)	Write a brief note on Globle Positioning System.	**07**

OR

Q.5	**(a)**	What is meant by GIS? Describe the functions of GIS.	**07**
	(b)	Describe the field procedure to determine the tacheometric constants k and c.	**07**

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