

# KADI SARVA VISHWAVIDYALAYA

B.E. (Civil) Semester-IV Examination, May'2014

Subject Code-CV-401

Date: 12/05/2014

Time: 10:30 am to 1:30 pm

Subject: Advanced Surveying

Total Marks: 70

## Instructions:

- (1) Answer each section in separate answer sheet
- (2) Use of scientific calculator is permitted
- (3) All questions are Compulsory
- (4) Indicate **Clearly**, the options you attempt along with its respective questions number.
- (5) Use the last page of main supplementary for **rough work**

## Section-I

### Q-1 (All Compulsory)

- (A) What is the principle of tacheometry? Derive the expressions for horizontal and vertical distances in the fixed hair method when the staff is held vertically and the measure angle is that of elevation. [5]
- (B) What is base line? Describe the procedure of its extension with neat sketch. [5]
- (C) Define : (1) True value, (2) Conditioned quantity, (3) Normal equation, (4) Most probable value (5) Direct observation, [5]

### OR

- (C) To find the RL of station B, two observations are taken by a theodolite from station A to BM and the other to the station B. The records are as follows. Find the RL of B and the distance between the BM & station B. RL of BM=110.00m [5]

Instrument station	Staff station	Target	Vertical angle	Staff Readings
A	B.M.	lower, upper	+ 5° & + 7°	0.655, 2.655
	B	lower, upper	- 5° & 4°	1.250, 3.200

### Q-2 Answer the following Questions

- (A) Explain in detail the field procedure of tacheometric survey which you have carried out. [5]
- (B) To determine horizontal distance AB between two stations A and B and RL of B, a tacheometer was set up at a point C on the line AB and the following observations were obtained on a staff vertically held. The constants of instrument are 100 and 0.00. [5]

Instrument station	Staff station	Vertical angle	Staff Readings	Remark
C	A	+ 4° 24'	2.215, 2.605, 2.975	R.L. of A is 151.00 M
	B	- 6° 20'	1.645, 1.920, 2.205	

### OR

- (A) Describe the method of determining of constants of tacheometer from field measurements. [5]

- (B) The altitude of two proposed stations A and B, 100 km apart are 520 m and 900 m respectively. The intervening obstruction situated at P, 70 km from A has an elevation of 480 m. 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 3.10 m above the surface of the ground. [5]

**Q-3 Answer the following Questions**

- (A) Define weight of an observed quantity? Discuss various laws of weights. [5]
- (B) Find the most probable values of the angles A & B from the following observations at a station O  
 $\angle A = 40^\circ 20' 36''$  Weight = 2  
 $\angle B = 50^\circ 30' 47''$  Weight = 3  
 $\angle C = 90^\circ 51' 26''$  Weight = 4

**OR**

- (A) Determine the most probable values of A, B and C from the following observations of equal weight. The angles fulfill the condition A+B=C  
 $\angle A = 30^\circ 24' 25.3''$ ,  
 $\angle B = 40^\circ 15' 14.2''$ ,  
 $\angle C = 70^\circ 39' 41.3''$  [5]
- (B) What are different types of errors in surveying measurements? Give one example of each. [5]

**Section-II**

**Q-4 (All Compulsory)**

- (A) Define GIS. What are the key components of GIS? Write functions of GIS. [5]
- (B) Describe schematically its essential parts and function of aerial camera. [5]
- (C) Explain following terms:  
(1) Crab, (2) Picture plane, (3) Focal length,  
(4) Overlap, (5) Drift. [5]

**OR**

- (C) Explain the following astronomical terms with sketch:  
(1) Celestial sphere, (2) Nadir, (3) Altitude of star,  
(4) Equinoctial Points, (5) Zenith. [5]

**Q-5 Answer the following Questions**

- (A) What is relief displacement? Derive an expression for the relief displacement in a vertical photograph. [5]
- (B) Determine the azimuth and altitude of a star from the following data  
Latitude of the observer  $45^\circ$  N  
Hour angle of star  $322^\circ$   
Declination of star  $10^\circ 30' S$

**OR**

- (A) Write Short note on PentaGraph [5]
- (B) Explain the various applications with suitable examples of Remote Sensing & differentiate between Active Remote sensing & Passive Remote sensing [5]

**Q-6      Answer the following Questions**

- (A) Describe Global Positioning System (GPS) in detail. [5]
- (B) A straight length of a highway AB appears to be 12.5 cm on a vertical air photograph of 15 cm focal length. The corresponding distance of the railway on a 1: 30,000 topographical maps is 9.00 cm. assuming the average elevation of the terrain as 1200 m above M.S.L., calculate the flying height of the camera above mean sea level.

**OR**

- (A) A ground area 30 km x 20 km is to be covered by aerial surveying. The following data are available : [5]
- Format size : 230mm x 230mm  
Scale : R.F. 1: 20,000  
Longitudinal overlapping : 60%  
Lateral overlapping : 20%  
Calculate the air base length & also the number of photographs required.
- (B) Describe how a total station has brought revolution in surveying. Describe briefly the salient features of total station. [5]

**\*\*\* All the Best\*\*\***

# KADI SARVA VISHWAVIDYALAYA

B.E. (Civil) Semester-IV Examination, November'2014

Subject Code-CV-401

Date: 03/11/2014

Time: 10:30 am to 1:30 pm

Subject: Advanced Surveying

Total Marks: 70

## Instructions:

- (1) Answer each section in separate answer sheet
- (2) Use of scientific calculator is permitted
- (3) All questions are Compulsory
- (4) Indicate **Clearly**, the options you attempt along with its respective questions number.
- (5) Use the last page of main supplementary for **rough work**

## Section-I

### Q-1 (All Compulsory)

- (A) Explain any two methods of tacheometry in details [5]
- (B) Describe principle of triangulation system and show schematically different sets of triangulation figures. [5]
- (C) Define : (1) True value, (2) True error, (3) Weight, (4) Most probable value (5) Direct observation, [5]

OR

- (C) To find the RL of station B, two observations are taken by a theodolite from station A to BM and the other to the station B. The records are as follows. Find the RL of B and the distance between the BM & station B. RL of BM=50.00m [5]

Instrument station	Staff station	Target	Vertical angle	Staff Readings
A	B.M.	lower, upper	+ 4° & + 7°	0.645,2.605
	B	lower, upper	- 4° & + 3°	1.200,3.250

### Q-2 Answer the following Questions

- (A) Describe the method of determining of constants of tacheometer from field measurements. [5]
- (B) A tacheometer was set up with an anallatic lens & having the value of constant 100 was used & following observation was made on staff held. R.L. of station M is 50.00 m Calculate the R.L. of P & Q & distance PQ [5]

Instrument station	Staff Station	H.I. cm	Vertical angle	Staff Readings
P	M	1.50	+ 2° 30'	1.200,1.830,2.460
	Q	1.50	- 4° 40'	1.350,1.850,2.290

OR

- (A) Differentiate : (1) Fixed hair method and Movable hair method (2) Theodolite and tacheometer [5]
- (B) Discuss Reduction to centre in geodetic triangulation and draw the sketch of four different position of satellite station. [5]

### Q-3 Answer the following Questions

- (A) Define weight of an observed quantity? Discuss various laws of weights. [5]

- (B) Following readings of levels were carried out : 2.335, 2.345, 2.350, 2.300, 2.315, 2.305, 2.325 and 2.315 [5]  
 Calculate (1) Probable error for single observation (2) Probable error for mean  
**OR**
- (A) The following observations gives the values of angles P, Q, R at a triangulation Station Q. Find the most probable values of P, Q, R [5]  
 $P = 21^\circ 18' 20''$ ,  $Q = 37^\circ 28' 15''$ ,  $R = 58^\circ 46' 35'' = P + Q$   
 (B) Enlist rules should be applied to field measurements for distribution of errors [5]

## Section-II

- Q-4** **(All Compulsory)**
- (A) Define GIS. What are the key components of GIS? Write functions of GIS. [5]  
 (B) Describe schematically its essential parts and function of aerial camera. [5]  
 (C) Explain following terms: (1) Tilt, (2) Picture plane, (3) Focal length, (4) Side lap, (5) Drift. [5]
- OR**
- (C) Explain the following astronomical terms with sketch: [5]  
 (1) Latitude, (2) Nadir, (3) Azimuth,  
 (4) Vertical circles, (5) Zenith.
- Q-5** **Answer the following Questions**
- (A) What is relief displacement? Derive an expression for the relief displacement in a vertical photograph. [5]  
 (B) Find the hour angle and declination of a star from the following data:  
 Latitude of place =  $48^\circ 30' N$ , Azimuth of star =  $50^\circ W$ , Altitude of star =  $28^\circ 24'$  [5]
- OR**
- (A) Write Short note on Autoset Level [5]  
 (B) Explain integration of Remote sensing and GIS [5]
- Q-6** **Answer the following Questions**
- (A) What is total station? Describe uses of total station in surveying. [5]  
 (B) A line PQ measures 12 cm on a photograph snapped by a camera with focal length of 22.5 cm. The same line measures A cm on the map drawn to scale of 1/45000. Determine flying height of aircraft if average altitude is 360 m. [5]
- OR**
- (A) A minar 72 m high appears at the principal point of a truly vertical photograph. On the Adjacent truly vertical photograph, the base of minar is on the X-axis & 92.8 mm to the left of the principal point. The size of the photograph is 210 mm x 210 mm. If the flying height of the aircraft is 1000 m & the focal length of camera lens is 125 mm, Determine (A) The distance of the minar top from Y-axis on the adjacent photograph (B) The percentage overlap between the two photographs [5]  
 (B) What is the principle of E.D.M.? Discuss electromagnetic waves and electromagnetic spectrum [5]

\*\*\*\*\* *All The Best* \*\*\*\*\*

# KADI SARVA VISHWAVIDYALAYA

B.E. (Civil) Semester-IV Examination, April'2015

Subject Code-CV-401

Date: 30/04/2015

Time: 10:30 am to 1:30 pm

Subject: Advanced Surveying

Total Marks: 70

## Instructions:

- (1) Answer each section in separate answer sheet
- (2) Use of scientific calculator is permitted
- (3) All questions are Compulsory
- (4) Indicate **Clearly**, the options you attempt along with its respective questions number.
- (5) Use the last page of main supplementary for **rough work**

## Section-I

### Q-1 (All Compulsory)

- (A) Write use of tacheometry survey in brief. Derive the formulas for distance and elevation in the fixed hair method for line of sight inclined & staff is held vertical and measure angle is that of depression. [5]
- (B) Write a short note on signals used in triangulation with sketch [5]
- (C) The following are the three angles observed at a station closing the horizon, along with their probable errors of measurements. Determine their corrected values.  $A = 85^\circ 13' 10'' \pm 2''$ ,  $B = 130^\circ 49' 30'' \pm 3''$ ,  $C = 143^\circ 57' 10'' \pm 4''$  [5]

### OR

- (C) The readings on a vertical staff held upon a B.M., whose R.L.=100.00 were 2.510, 1.590, 0.670, while the angle of elevation was  $+1^\circ$ . The readings at station P were 1.600, 1.060, 0.520, while the vertical angle was  $-1^\circ$ . Compute the horizontal distance from its instruments station X to P & its R.L., if the tacheometric constants are 100 & 0.30. Find gradient between P & B.M. [5]

### Q-2 Answer the following Questions

- (A) Derive an equation for the horizontal & vertical distance by the tangential method when both the angles are angles of depression [5]
- (B) From an eccentric station S, 15.00 meter to the west of the main station A, the following angles were measured.  $\angle ASB = 75^\circ 30' 15''$ ,  $\angle ASC = 60^\circ 30' 00''$  The stations S & B are to the opposite sides of the line AC. Calculate the correct angle CAB, if the lengths AC and AB are 6065.00 m & 5650.00 m respectively. [5]

### OR

- (A) Describe with a neat sketch, the construction & working of substance bar. [5]
- (B) To find the RL of station B, two observations are taken by a theodolite from station O to BM and the other to the station B. The records are as follows. Find the RL of B & the distance between the BM and station B. RL of BM=100.0 m [5]

Inst.St.	Staff station	Target	Staff Reading	Vertical angle
O	B.M.	lower, upper	0.655, 2.655	$-10^\circ, -7^\circ$
O	B	lower, upper	1.25, 3.2	$-5^\circ, +4^\circ$

### Q-3 Answer the following Questions

- (A) Discuss various laws of weights with examples. [5]

- (B) Define :** (1) Independent quantity, (2) Residual error., [5]  
 (3) Conditioned equation (4) Most probable value (5) Direct observation,

**OR**

- (A) Determine the most probable values of the angles of a triangle ABC, from the following given data. Use method of correlates.  $\angle A = 62^\circ 14' 12''$  weight 1 ,  $\angle B = 48^\circ 12' 14''$  weight 3 &  $\angle C = 69^\circ 33' 28''$  weight 2 [5]
- (B) The following readings were taken with a level under the identical conditions. Calculate the probable error of single observation, probable error of mean & maximum error. 2.810, 2.825, 2.835, 2.805, 2.850, 2.825, 2.820, 2.840, 2.845 & 2.835 [5]

**Section-II**

**Q-4 (All Compulsory)**

- (A) Explain following terms: (1) Crab, (2) Exposure station, [5]  
 (3) Focal length, (4) Air base, (5) Drift.
- (B) Describe schematically its essential parts and function of aerial camera. [5]
- (C) Describe how GIS can be useful in disaster management as a preventive and mitigation tool. [5]

**OR**

- (C) Explain the following astronomical terms with sketch: [5]  
 (1) Celestial sphere, (2) Nadir, (3) Altitude of star,  
 (4) Equinoctial Points, (5) Zenith

**Q-5 Answer the following Questions**

- (A) An ground area 40 km in East West direction & 30 km in North South direction is to be surveyed by vertical photograph having focal length 20 cm. Size of Photographs 15 cm x 15 cm. The average scale is to be 1:11000 for average elevation of 200 m above M.S.L. Longitudinal & lateral overlap is 60 % & 30 % respectively. The ground speed of aircraft shall be maintained at 140 Km/hour. The flight lines are to be laid in east-west direction on a existing map of scale 1:10000. Determine data for planning aerial survey. [5]
- (B) What is relief displacement? Derive an expression for the relief displacement in a vertical photograph. [5]

**OR**

- (A) Describe Global Positioning System (GPS) in detail. [5]
- (B) Find the azimuth and altitude of a star from the following data (1) Declination of star =  $22^\circ 45' N$  (2) Hour angle of star =  $45^\circ 15'$  (3) Latitude of the observer=  $55^\circ N$  [5]

**Q-6 Answer the following Questions**

- (A) Write Short note on Penta Graph with sketch [5]
- (B) Determine latitude of observation station & declination of star having altitude of  $74^\circ 24'$  at upper culmination & altitude of  $20^\circ 26'$  at lower culmination, both culminations occur on north side of Zenith. [5]

**OR**

- (A) The measured photo coordinates of images a & b of two ground points A & B are  $X_a=+45.35$  mm,  $Y_a=+38.41$  mm,  $X_b=-40.16$ ,  $Y_b=-45.65$  mm. Determine ground coordinates of A & B & hence compute horizontal length of line AB. The elevations of points A & B are respectively 200 m & 150 m above datum & flying height is 1500m above datum. Take  $f=152.4$  mm [5]
- (B) Write a short note on Electronic Digital Theodolite [5]

**KADI SARVA VISHWAVIDYALAYA**  
**B.E. (Civil) Semester-IV Examination, October'2015**

**Subject Code-CV-401**

**Date: 26/10/2015**

**Time: 10:30 am to 1:30 pm**

**Subject: Advanced Surveying**

**Total Marks: 70**

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**Instructions:**

- (1) Answer each section in separate answer sheet
- (2) Use of scientific calculator is permitted
- (3) All questions are Compulsory
- (4) Indicate **Clearly**, the options you attempt along with its respective questions number.
- (5) Use the last page of main supplementary for **rough work**

**Section-I**

**Q-1 (All Compulsory)**

- (A) What are the advantages of tacheometric surveying? Explain stadia method of tacheometry. [5]
- (B) What is triangulation? Explain principle of triangulation. [5]
- (C) Define : (1) True value, (2) True error, (3) Residual error, (4) Most probable value (5) Observed equation. [5]

**OR**

- (C) A tacheometer was set up at station P and the following readings were obtained on a vertically held staff. The constants of instruments were 100.0 and 0.10. Find the distance of BM from P and distance PQ, and also find out RL of Q.R.L. of B.M. is 1151.00 m. [5]

Instrument station	Staff station	Vertical angle	Staff Readings
P	B.M.	- 4° 0'	2.215, 2.605, 2.975
	Q	+10° 0'	1.645, 1.920, 2.205

**Q-2 Answer the following Questions**

- (A) Explain in detail the field procedure of tacheometric survey which you have carried out. [5]
- (B) To determine elevation of station B and C in a tacheometer survey, the following observations were with the staff held vertical. The instrument was fitted with an analytical lens and having multiplying constant was 100. Calculate R.L. of station B, C and horizontal distances BC and AC. R.L. of B.M. is 151.00 m. [5]

Instrument station	H.I.	Staff station	Vertical angle	Staff Readings
A	1.35	B.M.	- 6° 00'	1.335, 1.895, 2.460
A	1.35	C	+ 8° 30'	0.780, 1.265, 1.745
B	1.30	C	- 6° 20'	1.155, 1.615, 2.075

**OR**

- (A) What is tacheometric surveying? What are the applications of tacheometric survey? Mention the instruments used in tacheometric survey. [5]
- (B) Two triangulation stations A and B are 50 kilometres apart and have elevations 235 m and 250 m respectively. Find the minimum height of signal required at B so that the line of sight may not pass near the ground 3 meters. The intervening ground may be assumed to have uniform elevation of 200 meters. [5]

**Q-3 Answer the following Questions**

- (A) Discuss various laws of weights with examples. [5]

- (B) The following 10 readings were taken with a level under the identical [5] conditions. 1.810, 1.825, 1.835, 1.805, 1.850, 1.825, 1.820, 1.840, 1.845 & 1.835 meters. Calculate the probable error of single observation, probable error of the mean and the maximum error

**OR**

- (A) Determine the most probable values of A, B and C from the following [5] observations of equal weights. The angle fulfil the condition  $A + B = C$   
 $A = 40^\circ 20' 15'', B = 20^\circ 25' 16'', C = 60^\circ 35' 45''$
- (B) Explain the theory of least Squares. [5]

## Section-II

- Q-4** **(All Compulsory)**
- (A) Write short note on total station. [5]
- (B) Classify aerial photographs and write a brief note on "Aerial camera". [5]
- (C) Explain the following astronomical terms with sketch: [5]
- (1) Celestial poles, (2) Nadir, (3) Altitude of star,  
(4) Equinoctial Points, (5) Zenith.

**OR**

- (C) Calculate the minimum number of photographs to provide a stereoscopic cover [5] for a fairly level area with the following specifications
- (1) Scale of photography: 1:10,000  
(2) Length of strip: 50 km  
(3) Average fore and aft overlap: 60%  
(4) Size of photographs 23 cm x 23 cm

**Q-5 Answer the following Questions**

- (A) Write short note on Remote Sensing [5]
- (B) What is Azimuth? Explain various methods for determination of Azimuth of a [5] survey line.

**OR**

- (A) What is relief displacement? Derive an expression for the relief displacement in [5] a vertical photograph.  
(B) Explain Penta Graph with sketch. [5]

**Q-6 Answer the following Questions**

- (A) Describe Global Positioning System (GPS) in detail. [5]
- (B) To determine the average scale of an aerial photograph, three points A, B and C [5] were selected. Their elevations were obtained from contoured map as 1400m, 900m, and 1100m. If the flying height of the aircraft above mean sea level is 3500 m and the focal length of the camera lens is 160 mm, calculate the average scale of the aerial photograph.

**OR**

- (A) Explain the terms: [5]  
(1) Vertical photograph, (2) Tilted photograph (3) Oblique photograph
- (B) Define GIS. Enlist key components of GIS and give application of GIS in civil engineering [5]