

Heaven's Light is Our Guide
DEPARTMENT OF CIVIL ENGINEERING
RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY
 B.Sc. Engineering First Year Odd Semester Examination, 2018

CE 1101
 Surveying

Full marks: 72

Time: 3 Hours

- N.B:- (i) Answer any SIX questions, taking THREE from each section.
 (ii) Figures in the margin indicate full marks.
 (iii) Use separate answer script for each section.
 (iv) Assume reasonable value for any data missing.

SECTION-A

- Q.1(a) Write the importance of surveying. Define the terms: (i) Ranging (ii) Chain and (iii) Index sketch. 4.00
 (b) What factors should be considered in deciding the stations of a chain survey? 3.00
 (c) The area of the plan of an old survey plotted to a scale of 10m to 1cm measures now as 100.2 sq.cm as found by a planimeter. The plan is found to have shrunk so that a line originally 10 cm long now measures 9.5cm only. Again the 20m chain was 5cm too short. Find the (i) Shrunk scale and (ii) true area of the land surveyed. 5.00

- Q.2(a) Define the terms: (i) Orientation (ii) Datum (iii) Closing error and (iv) Bench Mark. 4.00
 (b) The following are the bearings of a closed traverse: 4.00

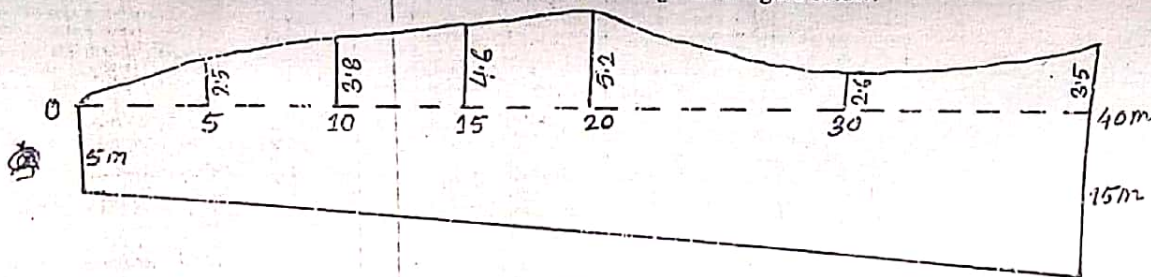
Side	AB	BC	CD	DE	EA
FB	N 45° E	S 65° E	S 20° W	S 80° W	N 40° W
BB	S 45° W	N 65° W	N 20° E	N 80° E	S 40° E

Calculate the interior angles of the traverse.

- (c) A page of a level book with some missing readings is reproduced below. Fill in the missing entries along with the necessary checks. 4.00

Station	BR	IR	FR	Rise (+)	Fall (-)	RL
1	3.65					108.26
2		?		2.75		?
3		2.83				?
4		3.64				?
5			2.42			?

- Q.3(a) Define "contour" and "contour interval". Write the uses of contour map. 3.00
 (b) Calculate the area in katha and decimal from the data as given in figure below: 4.00



- (c) A railway embankment of formation width of 8m and slope 2:1 is to be constructed. The ground level along the centre line is as follows: 5.00

Chainage (m):	0	50	100	150	200	250
GL. (m):	115	114	116	115	118.50	118.25

The embankment has a rising gradient of 1 in 100. The formation level at zero chainage is 115. Compute the volume of earthwork.

- Q.4(a) Define (i) Nautical mile, and (ii) Civil time. What is the visible horizon distance from a tower 50m high? 4.00
 (b) Calculate the distance in km between two points A and B on equator but longitudes of A and B are 150° E and 110° W respectively. 3.00
 (c) Given the Greenwich Civil Time (G.C.T) as 6^h40^m12^s P.M. on April 3, 2015. Find the L.M.T. at the places having longitudes (i) 72° 30' W and (ii) 110° 32' 30" E. 5.00

SECTION-B

- Q.5(a) Define the terms (i) Shift of a curve (ii) Super elevation (ii) Transition curve. 3.00
 (b) What are the properties of simple circular curve? Write down the characteristics of transition curve. 4.00
 (c) Two tangents intersect at chainage 1500m. The angle of intersection is 150°. Calculate all data necessary for setting out a curve of radius 300m by the deflection angle method. The peg intervals may be taken as 20m. 5.00

Q.6(i) What is the principle of tacheometry? What is the difference between the fixed hair method & moveable hair method?

(b) Write down the errors and precisions in stadia tacheometry.

(c) The following observations were made in a tacheometric survey.

Instrument station	Height of axis	Staff Station	Vertical Angle	Hair readings (m)	Remarks
A	1.42	BM	$-6^{\circ}30'$	0.905, 1.52, 2.10	RL of BM = 465.70 m
A	1.42	B	$+9^{\circ}0'$	0.795, 1.75, 2.65	
B	1.50	C	$+11^{\circ}0'$	1.60, 2.35, 3.10	

Calculate the RLs of A, B and C and the horizontal distances AB and BC. The tacheometer is fitted with an anallatic lens and the multiplying constant is 100.

Q.7(a) Why overlap is necessary in photogrammetric surveying?

(b) Find an expression of relief displacement on a vertical photograph.

(c) The scale of an aerial photograph is 1cm = 160m. The photograph size is 20cm x 20cm. Determine number of photographs required to cover an area of 35km x 35km, if overlap is 60% and the side lap 30%.

Q.8(a) What do you mean by remote sensing? Write down the principles of remote sensing.

(b) Suppose you are a retailer, want to start a new business in a suburb. Which technology would help you select the best possible zone? Explain.

(c) What is GPS? How GPS will help you to build heavy Civil engineering infrastructure?

(d) Write down the different stages of railway project survey.

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Heaven's Light is Our Guide

DEPARTMENT OF CIVIL ENGINEERING
RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY
B.Sc. Engineering FIRST year ODD SEMESTER Examination, 2017

CE 1101
Surveying

Full Marks: 72

Time: 3 Hours

N.B.:-

- (i) Answer SIX questions, taking THREE from each section.
- (ii) Figure in the margin indicates full marks.
- (iii) Use separate answer script for each section.
- (iv) Assume reasonable value for any data not given.

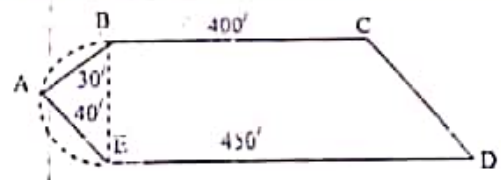
উত্তর লিখতে হবে
নম্বর ইতি-সম্পর্কিত সমস্যা
যোগাযোগ: ০১৮২২-০৫০৭৯৪

SECTION-A

- Q.1(a) Distinguish between (i) plain scale and diagonal scale (ii) plain surveying and Geodetic surveying (iii) Well-conditioned and ill conditioned triangles (iv) ranging and chaining. 4.00
- (b) Enter the field book according to the following field notes: (i) Chainage of line AB is 95.5m (ii) The offset of the pond at the left of chain line are as follows:
Chainage : 10, 15, 20, 25, 30m
Offset : 16, 12, 10, 14, 20m
(iii) The offset of the river at the right of chain line are as follows:
Chainage : 5, 25, 40, 80m
Offset : 13, 17, 19, 19.5m
- (c) Write the expression for (i) Temperature Correction (ii) Pull correction and (iii) Sag correction of a steel tape. 4.50
- Q.2(a) Define the terms: (i) Reconnaissance survey (ii) Well-conditioned triangle (iii) Local attraction 3.00
- (b) What is orientation? Write the five advantages of plane tabling. Write the uses of contour map. 4.00
- (c) The following is the page of a level book. Calculate the RL of different station point and apply the usual checks. RL of BM = 99.251m. 5.00

Station Point	Distance (m)	BS	IS	FS	RL of line of collimation	RL	Remarks
1	00	3.150					BM
2	20		1.245				
3	40		1.125				
4	80	3.125		0.860			C.P
5	100		2.760				
6	120		1.835				
7	140		1.470				
8	160			1.965			

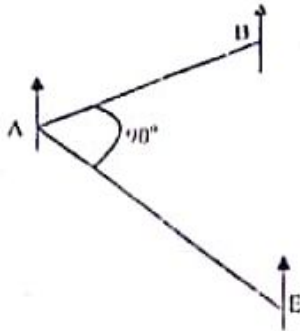
- Q.3(a) State the trapezoidal rule and Simpson's rule for the calculation of area. What is the limitation of Simpson's rule? 3.00
- (b) Calculate the area of land in Katha and decimal indicated by ABCDEA as shown in figure. 4.00



- (c) A tower stands on the ground, the level of which is 20.25 m above datum. From a theodolite station, 25 m away horizontally an angle of elevation of $12^{\circ}42'$ is obtained. If the height of the instrument is 1.25m and the RL of the instrument station is 21.45m how high is the tower? 5.00
- Q.4(a) Define the terms: (i) Observer's meridian (ii) Altitude (iii) Ecliptic (iv) Dip of horizon (v) Nautical mile and (vi) Civil time. 3.00
- (b) The longitude of a place A is $150^{\circ}E$ and the longitude of place B is $110^{\circ}W$. Calculate the distance in Km between two points A and B on equator. Also find the shortest distance between two points A($45^{\circ}N, 30^{\circ}E$) and B($30^{\circ}N, 15^{\circ}W$). 4.00
- (c) The longitude of Rajshahi, Dhaka and Sylhet are $88^{\circ}45'E$, $90^{\circ}15'E$ and $91^{\circ}30'E$ respectively. Find the sunset time at Sylhet and Rajshahi when sunset time at Dhaka is 6h 50m PM. Also find the GMT correspond to the L.M.T 6h 50m PM at Dhaka.

SECTION-B

- Q.5(a) Write the characteristics of closed traverse. Explain the graphical method to adjust the closing error of a closed traverse. 6.00
- (b) The F.B and B.B of a line are $95^{\circ}30'$ and $275^{\circ}0'$. How will adjust the bearing? 2.00
- (c) Find the F.B of line AB and line AE when F.B of line BA = 220° from figure as shown.



- Q.6(a) Define the terms: (i) Degree of curvature (ii) Super elevation (iii) Compound curve (iv) Transition curve. 4.00

(b) Derive the following relation $O_x = \sqrt{R^2 - x^2} - (R - O_0)$ where symbols carry the usual meaning. 4.00

(c) The following are the records of a tacheometric survey 4.00

Instrument station	Staff Station	Bearing	Vertical angle	Hair readings
A	B	$W30^{\circ}30'E$	$+10^{\circ}0'$	1.250, 1.750, 2.250
B	C	$S40^{\circ}0'E$	$+5^{\circ}0'$	0.950, 1.750, 2.550
C	D	$S45^{\circ}0'W$	$+8^{\circ}0'$	1.550, 2.150, 2.750

Multiplying constant = 100 and additive constant = 0, the staff is held vertically. Calculate the length and bearing of DA.

- Q.7(a) Describe different phases of implementing an Airport project survey. 6.00

(b) How do you determine the number of photographs necessary to cover a given area in aerial survey? 3.00

(c) The scale of an aerial photograph is $1\text{cm} = 100\text{m}$. The photograph size is $20\text{cm} \times 20\text{cm}$. If the longitudinal lap is 60% and side lap is 30%, calculate the number of photographs required to cover an area of (i) 100Km^2 (ii) $10\text{Km} \times 10\text{Km}$. Also comment on your results. 3.00

Q.8(a) What is remote sensing? Write five application of remote sensing. 3.00

(b) What is the principle of remote sensing? Explain briefly. 3.00

(c) What is GPS? How does the GPS work? 3.00

(d) If GPS took 0.12 seconds to receive a signal transmitted by a satellite floating directly overhead from a point on earth. Find the distance of the point from the satellite. 3.00

CE 1101
Surveying

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Time: 3 Hours

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 (iv) Assume reasonable value for any data missing.

জরুরী ফোনসংখ্যা
 মর্শন ইউনিভার্সিটি
 নোং: ০১৯২২-০৭০২০৪

SECTION-A

- Q.1 (a) Distinguish between: (i) Ranging and chaining, (ii) Plain scale and diagonal scale (iii) Offset and optical square 3.00
 (b) Define "Orientation". State and prove the Simpson's rule for calculation of area. Compare between Trapezoidal rule and Simpson's rule 4.50
 (c) Prove that the latitude of the observer is always equal to the altitude of the pole. What is the visible horizon distance from a tower 55 m high? 4.50

- Q.2 (a) Longitude of Rajshahi is $89^{\circ}10'12''E$ and longitude of Sylhet is $+91^{\circ}25'27''$. Ascertain the sunset time at Rajshahi when sunset time at Sylhet is 6h30m PM. 3.00

- (b) The following is the page of a level book. Calculate the missing data and apply necessary checks. 6.00

Distance	BR	IR	FR	Rise	Fall	R.A.
0	4.25					?
50		7.65				?
100		9.86				?
150	10.21		11.78			108.60
200		5.84				?
250		4.96				?
300			13.21			?

- (c) Calculate the distance in Km between two points A (long. $116^{\circ}24'W$) and B (long. $+147^{\circ}6'$) along the parallel of latitude $12^{\circ}36'S$. 3.00

- Q.3 (a) Find the height and distance of a tower with the help of a theodolite and tape, when ground is levelled. Chaining is obstructed by a river. 3.00

- (b) What are the advantages and disadvantages of plane tabling? 3.00

- (c) A railway embankment of formation width of 8m and side slope 2:1 is to be constructed. The ground level along the centre line is as follows 6.00

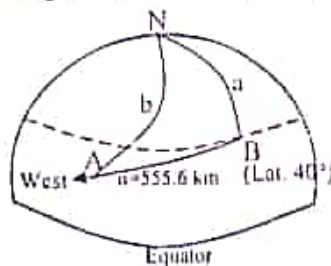
Chainage: 0 50 100 150 200 250
 GL (m): 115.75 114.35 116.80 115.20 118.50 118.25

The embankment has a rising gradient of 1 in 100, and the formation level at zero chainage is 115.00. Assuming the ground is level across the centre line, Compute the volume of earthwork.

- Q.4 (a) Write the four important characteristics of contours and the four important uses of contour map 3.00

- (b) A chain line PQ intersects a pond. Two points A and B are taken on the chain line on opposite sides of the pond. A line AC, 250m long, is set out on the left of AB and another line AD, 300m long, is set out on the right of AB. Points C, B and D are in the same straight line. CB and BD are 110m and 140m long respectively. Calculate the length of AB. 3.00

- (c) Find the latitude of A from the data given in the figure. Also find the $\angle NAB$. 6.00



SECTION-B

- Q.3 (a) Define the following terms (i) True meridian (ii) Forward bearing and (iii) Local attraction. 3.00
 (b) What is closing error in a traverse? Describe with sketch, how such an error is adjusted. 4.00
 (c) The following are the observed bearings of the lines of a traverse ABCDEA with a compass in a place where local attraction was suspected. 5.00

A	1.345	C	+10°0'	1.500, 2.250, 3.000
B	1.550			

Calculate the RLs of A, B and C, and the horizontal distances AB and BC. The tachometer is fitted with an anallatic lens and the multiplying constant is 100.
Write down the different stages of railway project survey.

- Q.7(a) Explain why superelevation is required in roads and railways. 2.00
 (b) Derive an expression for ordinate which are taken from long chord to set horizontal curve by chain and tape method. 2.00
 (c) Two straight lines AC and CB, to be connected by a 3° curve, intersect at a chainage of 2760m. The WCBs of AC and CB are 45°30' and 75°30' respectively. Calculate all necessary data for setting out the curve by the method of offsets from the long chord. 4.00

- Q.8(a) What is GPS? In GPS technology, how is the receiver position calculated? 3.00
 (b) What do you mean by remote sensing? What are the types of remote sensing? 3.00
 (c) Derive an expression for the length of line between points of different elevations from measurement on a vertical photograph. 3.00

- (d) Two points A and B having elevations of 500m and 300m respectively above datum appear on the vertical photographs having focal length of 20cm and flying altitude of 2500m above datum. Their corrected photographs co-ordinates are as follows: 3.00

Point	Photographic x (cm)	Co-ordinates y (cm)
a	+2.65	+1.36
b	-1.92	+3.65

Determine the length of the ground line AB.

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17/05/05 - Chem
 24/05/05 - Phy
 30/05/05 - Hum
 06/06/05 - Math

CE-1101
Surveying

Full marks: 72

Time: 3 Hours

- N.B:-
- Answer any SIX questions, taking THREE from each section.
 - Figures in the margin indicate full marks.
 - Use separate answer script for each section.
 - Assume reasonable value for any data missing.

জুয়েল ফটোষ্ট্যাট
মর্দান ইউনিভার্সিটির সাহায্যে
মোবাইল: ০১৯২২-০৭০৭০৫

SECTION-A

- Q.1 (a) What are offsets? How are perpendicular and oblique offsets taken? 3.00
 (b) Distinguish between: (i) Ranging and Chaining (ii) Offset and Optical square (iii) Check line and Tie line. 4.50
 (c) Write the expression of correction of chain for (i) Pull correction (ii) Sag correction & (iii) Temp. correction 4.50
- Q.2 (a) What is the principle of plane tabling? Mention the advantages and disadvantages of plane tabling? 4.00
 (b) State and Prove the Simpson's rule. 4.00
 (c) An embankment of width 10m and side slopes $1\frac{1}{2}:1$ is required to be made on a ground which is level in a direction transverse to the centre line. The central heights at 40m intervals are as follows. 4.00
 0.90, 1.25, 2.15, 2.5, 1.85, 1.35 and 0.85
 Calculate the volume of earth work according to (i) Trapezoidal formula, and (ii) the Prismoidal formula.
- Q.3 (a) Define the terms: (i) Bench Mark (ii) line of collimation (iii) leveling staff and (iv) contour map. 4.00
 (b) When is reciprocal levelling done? Describe the method along with a sketch. 3.00
 (c) In a leveling operation, the B. M (R.L = 50.525m) is 1.235m below the line of collimation in a setting of the level. From this set-up the staff reading 1.284, 3.513, 2.974 and 3.106 were taken on stations A, B, C and D respectively. Calculate the R.L of A, B, C and D which are 20m apart from one another, after entering them in a level-book form. Apply necessary arithmetic checks. 5.00
- Q.4 (a) Define the terms: (i) Observer meridian (ii) Altitude (iii) Obliquity of ecliptic and (iv) Civil time. 4.00
 (b) What are the Napier's rules for the solution of right angle spherical triangle? 2.50
 (c) In a right angled spherical triangle APB, Latitude of A = +40°, Latitude of P = +90°, and $\angle PAB = 90^\circ$ and point B is 300 nautical mile east from Point A. Calculate the other angles and sides by Napier's rules of circular parts. 5.00

SECTION-B

- Q.5 (a) Define the following terms (i) Local attraction (ii) Magnetic declination (iii) Whole circle bearing and reduced bearing. 3.00
 (b) What is closing error in a traverse? Describe, with sketch, how such an error is adjusted. 4.00
 (c) The following are the observed bearings of the lines of a traverse ABCDEA with a compass in a place where local attraction was suspected 5.00

Line	FB	BB
AB	191°45'	13°0'
BC	39°30'	222°30'
CD	22°15'	200°30'
DE	242°45'	62°45'
EA	330°15'	147°45'

Find the correct bearings of the lines.

- Q.6 (a) Define the terms: (i) Degree of curvature & (ii) Super elevation. 2.00
 (b) Write the field procedure of setting out a curve by one theodolite method. 4.00
 (c) Two tangents intersect at chainage 1250m the angle of intersection is 150°. Calculate the all data necessary for setting out a curve of radius 250m by the deflection angle method. The peg intervals may be taken as 20m. 6.00
- Q.7 (a) What is remote sensing? Write down the principle of remote sensing. 3.00
 (b) What is GPS? Show the GPS satellite constellation with sketching. 3.00
 (c) A tachometer was setup at a station C and the following reading were obtained on a staff vertically held 6.00

Instrument Station	Staff station	vertical angle	Heav readings	Remarks
C	B.M.	-5°10'	1.15, 1.80, 2.45	R.L of BM = 750m
C	D	+7°12'	0.75, 1.50, 2.25	

Calculate the horizontal distance CD and RL of D when the constant of tachometer are 100 and 0.15.

- Q.8 (a) Describe the method of determining the constants of a tachometer from field measurements. 3.00
 (b) How do you determine the number of photographs necessary to cover a given area in aerial survey? 3.00
 (c) Describe different phases of implementing a highway project. 6.00

**CE 1101
 Surveying**

Full marks: 70

Time: 3 Hours

- N.B:-**
- (i) Answer any **SIX** questions, taking **THREE** from each section
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 - (iv) Assume reasonable value for any data missing.



SECTION-A

- Q.1**
- (a) Differentiate between Ranging & Chaining. Describe the method of ranging a chain line between two stations which are not intervisible. 4.67
 - (b) Distinguish between plain scale & diagonal scale. Why graphical scales are always drawn on all survey maps. 4.00
 - (c) Define the following terms: (i) Field book (ii) Well-conditioned triangle and (iii) Optical square. 3.00
- Q.2**
- (a) Define the following terms: (i) Whole circle bearing and reduced bearing (ii) Isogonic and agonic lines (iii) magnetic declination. 3.00
 - (b) Describe, with a sketch, how closing error in a traverse is adjusted. 3.67
 - (c) The following are the bearings observed in traversing with a compass, an area where local attraction was suspected. Calculate the interior angles of the traverse and correct them if necessary. 5.00
- | Line | FB | BB |
|------|---------|---------|
| AB | 150°0' | 330°0' |
| BC | 230°30' | 48°0' |
| CD | 306°15' | 127°45' |
| DE | 298°0' | 120°0' |
| EA | 49°30' | 229°30' |
- Q.3**
- (a) Define the following terms (i) Bench marks (ii) Back sight reading (iii) Line of collimation. 3.00
 - (b) Deduce a combined expression for the curvature correction and refraction correction in leveling. 3.00
 - (c) What are the different methods of contouring? Describe any method along with sketch. 3.00
 - (d) What is the visible horizon distance from a tower 50 m high? What is the dip of the horizon assuming the radius of the earth to be 6370 km? 2.67
- Q.4**
- (a) Define the following terms: (i) Nautical mile (ii) Observer's meridian (iii) Latitude. 3.00
 - (b) Write the name of various method of plane tabling. Describe the back sighting method of orientation. 4.00
 - (c) The standard time meridian of Bangladesh is 90°23'E. Find the standard time in Bangladesh for the GMT 5°58'28'PM. 2.67
 - (d) What are the Napier's rule for the solution of right angle spherical triangle? 2.00

SECTION-B

- Q.5**
- (a) Illustrate the basic principle of tachometric surveying. What is anallatic lens? 4.00
 - (b) A tachometer was setup at a station P and the following reading were obtained on a staff vertically held. 3.00

Instrument station	Staff station	Vertical angle	Hair readings (m)	Remarks
P	B.M.	-3°20'	1.50, 1.80, 2.15	RL of B.M. = 740.5m
P	Q	-8°12'	0.75, 1.50, 2.25	

- (c) Write down the basic concept of GPS. 2.00
- Q.6**
- (a) What is transition curve? Why and where are transition curves provided? 3.00
 - (b) Describe the method of setting a horizontal curve by chain and tape method. 3.00
 - (c) Two tangents AB and BC intersect at a point B at chainage 150.5 m. Calculate all the necessary data for setting out a circular curve of radius 100m and deflection angle 30° by the method of offsets from the long chord. 4.00

- Q.7(a) What is GIS? Why should we study about GIS?
- (b) What do you mean by Crab and Drift?
- (c) Why overlapping is provided in photographs?
- (d) The scale of an aerial photograph is 1cm = 100 m. The photograph size is 20 cm x 20 cm. Determine the number of photographs required to cover an area of 100sq. km, if the longitudinal lap is 60% and the side lap is 30%.

- Q.8 (a) Describe the different phases of implementing a railway project.
- (b) A coastal embankment at a constant R.L. of 60 ft is to be constructed. The transverse ground is levelled. The following are the levels of the ground surface along the alignment at 50 ft interval. The width of the formation level is 25ft and side slope 2:1

Chainage	:	0	50	100	150	200	250	300	350	400
Surface level	:	58	56	54	50	48	52	57	58	54

Calculate the volume of earthwork by Trapezoidal rules.

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CE 101
 Surveying

Full Marks: 70

Time: 3 Hours

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জরুরী কেসি-০১০
 নতুন ইডেন্টিফিকেশন কার্ড
 মোবাইল: ০১৯২২-০৭০৭০২

SECTION-A

- Q.1(a) Define the terms: (i) Representative fraction, (ii) Hypotenusal allowance, (iii) Tie line. 3.00
 (b) Describe with sketches how an obstacle can be crossed over in chain survey when (i) it interrupts chaining but not ranging, (ii) it interrupts ranging but not chaining. 4.00
 (c) The area of the plan of an old survey plotted to a scale of 10 meters to 1 cm measures now as 100.2 sq.cm as found by planimeter. The plan is found to have shrunk so that a line originally 10 cm long now measures 9.7 cm only. There was a note on the plan that the 20 m chain used was 8 cm too short. Find the true area of the survey. 4.67
- Q.2(a) Distinguish between (i) WCB and RB, (ii) True meridian and magnetic meridian and, (iii) Closing error and local attraction. 5.00
 (b) Prove that the altitude of the pole is equal to the latitude of the observer. 2.67
 (c) A traverse ABCDA is made in the form of a square taking in clockwise order. If the bearing of AB is $120^{\circ}30'$, find the bearing of other sides. 4.00
- Q.3(a) Define the following terms: i) Reduced level, ii) Fly levelling, iii) Bench mark. 3.00
 (b) Define 'orientation'. Explain the merits and demerits of plane tabling over theodolite surveying. 3.00
 (c) Explain the effect of curvature and refraction in leveling. Discuss the uses of contour map. 3.00
 (d) Find the error of reading of a level staff if the observed reading is 12.64 ft and the point sighted, the staff is $6''$ off the vertical through the bottom. 2.67
- Q.4(a) What are the Napier's rules for the solution of right angle spherical triangle? Write down the properties of a spherical triangle. 4.00
 (b) Find the shortest distance between two places A and B, given that the latitude of A and B are $15^{\circ}0'N$ and $12^{\circ}6'N$ and their longitude are $50^{\circ}0'E$ and $54^{\circ}0'E$ respectively. Radius of the earth is 6370 km. 5.00
 (c) Write the name of various method of plane tabling. 2.67

SECTION-B

- 5(a) Describe different phases of implementing a highway project. 8.00
 (b) What are the essential phases of conducting a city surveying? 3.67
- 6(a) Explain the fundamental principle of stadia surveying with its merits and demerits. 3.00
 (b) What are the tachometer constants? How are they determined? 4.00
 (c) A tachometer was placed with its axis horizontal 1.56 m above a station P whose RL is 97.45 m. A staff was held at Q vertically and the stadia readings are 1.35, 1.96, and 2.58. Calculate the distance between P and Q and the RL of Q. 4.67
 123 / 97.65
- 7(a) What is a shift of a curve? "Transition curve bisects the shift"- Explain. 4.00
 (b) Discuss the different types of problem that faced in curve setting. 3.00
 (c) Two tangents intersects at a chainage of 1000 m, the deflection angle being 30° . Calculate all necessary data for setting out a circular curve of radius 200 m by the method of offsets from the chord produced, taking a peg interval of 20 m. 4.67
- 8(a) What is prismoid? Derive the prismoidal formula for calculation of volumes. 4.00
 (b) The following offsets were taken at 12 m intervals from a survey line to an irregular boundary line: 3.5, 4.3, 6.7, 5.3, 7.5, 8.8 & 7.9 m. Calculate the area enclosed between the survey lines, the irregular boundary line and the first and last offsets by the (i) Trapezoidal rule (ii) Simpson's rule. 459.6 / 453.6 5.00
 (c) What is GPS? Write down the sources of errors in GPS? 2.67

The End

Full marks: 70

Time: 3 Hours

- N.B. :-
- Answer any SIX questions, taking THREE from each section.
 - Figure in the margin indicate full marks.
 - Use separate answer script for each section.
 - Assume reasonable value for any data missing.

SECTION-A

- Q.1(a) Differentiate between Ranging and Chaining. Describe how you would range a chain line between two points which are not inter-visible. 3.50
- (b) What are the points to be kept in mind while selecting survey stations of a chain survey? Define the terms: (i) Offset (ii) Field Book and (iii) Tie line. 3.50
- (c) A steel tape supported on the ground is 33 m long at a temperature of 32°C and with a pull of 25 kg. What horizontal distance will it subtend if it is hung over two poles at the same level with a pull of 70 kg and if its temperature is 40°C. The weight of the tape is 1.55 kg and coefficient of linear expansion is 11.5×10^{-6} per 1°C and its $E = 2.1 \times 10^6$; wt. of 1 cu.cm of steel = 7.75 gms. 4.67
- Q.2(a) Write the characteristics of closed traverse. The F.B. of a line is $96^\circ 30'$ and B.B. $176^\circ 0'$. How will you adjust the bearing? 3.67
- (b) What are the different types of correction for balancing a traverse? Explain 3.00
- (c) The following fore and back bearings were observed during traversing and area with a compass: 5.00
- | Line | FB | BB |
|------|-------------------|-------------------|
| PQ | $S37^\circ 30' E$ | $N37^\circ 30' W$ |
| QR | $S43^\circ 15' E$ | $N44^\circ 15' E$ |
| RS | $N73^\circ 00' W$ | $S72^\circ 15' E$ |
| ST | $N12^\circ 45' E$ | $S13^\circ 15' W$ |
| TP | $S60^\circ 00' E$ | $S59^\circ 15' W$ |
- Find the corrected bearing of the line.
- Q.3(a) Write short notes on: (i) Level line (ii) Contours (iii) Bench Mark and (iv) Height of the instrument. 4.00
- (b) Two adjacent sides and their included angle ($\alpha < 90^\circ$) of a triangle are known. Calculate the length of side opposite to angle α . 1.67
- (c) In a leveling operation, the B.M. (R.L. = 150.5 ft) is 3.2 ft below the height of the instrument in a setting of the instrument. From this set-up of the instrument the staff readings 4.72, 2.60, 5.82 and 8.78 were taken at points A, B, C and D respectively. Calculate the R.L. of A, B, C and D which are 50 ft apart from one another, after entering them in a level book form. Apply necessary arithmetic checks. 6.90
- Q.4(a) What is orientation? Describe the back sighting method of orientation. 3.67
- (b) The following perpendicular offsets were taken from a chain to an irregular boundary: 4.60
- | Chainage | 0 | 10 | 25 | 40 | 60 | 75 |
|----------|------|------|------|------|------|------|
| Offset | 15.5 | 26.4 | 31.6 | 25.6 | 29.5 | 31.4 |
- Calculate the area between the chain line, the boundary and the offsets.
- (c) An excavation is to be made for a reservoir 30 m long and 2.5 m wide at the bottom. The side slope of the excavation has to be 3:1. Calculate the volume of earth work by prismatic formula with seven ordinates. The depth of excavation is 6 m and ground is level at the site. 4.99

SECTION-B

- Q.5(a) Write down the properties of a spherical triangle. 3.67
- (b) Define the terms: (i) Observer meridian (ii) Altitude (iii) Nautical mile and (iv) Obliquity of ecliptic. 4.00
- (c) What are the uses of contour maps? Name the characteristics of contours. 4.00
- Q.6(a) What are the different stages of conducting a railway project survey? Write the steps of operate a detailed preliminary survey. 6.90
- (b) Explain the theory of stadia tachometry. 3.67
- (c) Describe how to determine the tachometric constants by field measurement method. 3.00
- Q.7(a) What is shift? Draw a neat sketch of a transition curve and show how to lay it out. 4.00
- (b) What is initial and final sub-chords? 2.67
- (c) Explain the field procedure of setting out a curve by one-theodolite method. 3.00
- Q.8(a) Explain the scale of a vertical photograph. 3.00
- (b) What is side lap and over lap? Explain the reasons of over lap. 4.67
- (c) Two tangents intersect at chainage 1250m. The angle of intersection is 150° . Calculate all data necessary for setting out a curve of radius 250 m by the deflection angle method. The peg intervals may be taken as 20 m. Prepare a setting out table when the least count of the vernier is $20''$. 4.99

Full Marks: 70

Time: 3 Hours

- A.B. (i) Answer SIX questions, taking THREE from each section.
 (ii) Figures in the margin indicate the full marks.
 (iii) Use separate answer script for each section.
 (iv) Assume reasonable value for any data not given.

SECTION - A

- Q.1 (a) Explain the terms: (i) Graphical scale, (ii) Precision and (iii) True Error. 2.00
 (b) Explain the different methods of chaining on sloping ground. What is hypotenusal allowance? 4.00
 (c) The area of the plan of an old survey plotted to a scale of 10 metres to 1 cm measures now as 100 sq cm. as found by a planimeter. The plan is found to have shrunk so that a line originally 10 cm long now measures 9.7 cm only. Find (i) the shrunk scale, and (ii) true area of the survey. 6.00
- Q.2 (a) Define the terms (i) Local Attraction and (ii) True Bearing. 2.00
 (b) What is closing error? How it can be balanced graphically? 3.00
 (c) The following are the observed bearings of the lines of a traverse ABCDEA with a compass in a place where local attraction was suspected. 6.00

Line	AB	BC	CD	DE	EA	
FB	191° 45'	39° 30'	22° 15'	242° 45'	350° 15'	6.00
BU	138° 0'	222° 30'	200° 30'	62° 45'	147° 45'	

Find the correct bearings of the lines.

- Q.3 (a) Explain the terms (i) Dip, (ii) Benchmarks and (iii) Fly levelling. 3.00
 (b) What factors should be considered to select a proper contour interval? Describe it. 2.00
 (c) What are the different sources of error in plane tabling? How are they eliminated. 2.00
 (d) The observation ray between two triangulation stations A and B just grazes the sea. If the heights of A and B are 9000 metres and 3000 metres respectively, determine approximately the distance between A and B. 4.00

- Q.4 (a) State Simpson's rule. Derive an expression for it. 5.00
 (b) A coastal embankment at a constant reduce level of 15.00 is to be constructed. The traverse ground is leveled. The following are the levels of the ground surface along the alignment at 50 ft interval. The width of the formation level is 25 ft, side slope 2:1. 6.00

Chamage:	0	50	100	150	200	250	300	350	400
Surface level:	58	56	54	50	48	52	57	58	54

Calculate the volume of earthwork.

SECTION - B

- Q.5 (a) What are the multiplying constant and additive constant of a tachometer? How would you obtain these constant in the field? 4.00
 (b) A tachometer was set up at a station C and the following readings were obtained on a staff vertically held. 7.00

Inst. Station	Staff station	Vertical Angle	HM readings (m)	Remarks
C	BM	5° 20'	1.500, 1.800, 2.150	100 of 511, 750, 500m
C	D	8° 12'	0.750, 1.500, 2.250	

Calculate the horizontal distance CD and RL of D, when constants of instrument are 100 and 0.15.

- Q.6 (a) Define the terms (i) Super elevation and (ii) Degree of curvature. 3.00
 (b) Write down the requirements of transition curve. 3.00
 (c) A transition curve is required for a circular curve of 200 m radius. The gauge being 1.5m and maximum super-elevation restricted to 15 cm. The transition is to be designed for a velocity such that no lateral pressure is imposed on the rails and the rate of gain of radial acceleration is 30 cm/sec². Calculate the required length of the transition curve and the design speed. 5.00

- Q.7 (a) Define the terms: (i) Zenith and Nadir, (ii) Co-l and (iii) Overlap. 3.00
 (b) What are the Napier's rules for the solution of right angle spherical triangle? 1.00
 (c) What is GPS? Write down the basic concept of GPS. 3.00
 (d) Find the shortest distance between two places A and B, given that the latitude of A and B are 15° 0' N and 12° 6' N and their longitude are 50° 12' E and 54° 0' E respectively. Radius of Earth is 6370 km. 4.00

- Q.8 (a) Derive an expression for the length of a line between points of different elevations from measurement on a vertical photograph. 3.00
 (b) How do you determine the number of photograph necessary to cover a given area in an aerial survey? 3.00
 (c) The scale of an aerial photography is 1cm = 100m. The photograph size is 20cm x 20cm. Determine the number of photographs required to cover an area of 100sq.km., if the longitudinal lap is 60% and the side lap is 30%. 5.00