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Question Paper Code : 10222

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2012.

Fourth Semester

Civil Engineering

CE 2254/101404/CE 45/CE 1254/080100021 — SURVEYING — II

(Common to PTCE 2254 — Surveying II for B.E. (Part-Time) Second Semester — Civil Engineering — Regulation 2009)

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. What is a tacheometer?

2. Enumerate the errors caused due to manipulation and sighting in tacheometric surveying.

3. Triangulation networks for covering a large area are composed of any one or a combination of basic figures arranged as a series of chains or a connected centralized network. Enumerate any two such arrangements.

4. List any four corrections that may be necessary when measuring the length of a baseline.

5. Distinguish between the observed value and the most probable value of a quantity.

6. What are normal equations?

7. Define the Right Ascension (R.A.).

8. Enumerate the properties of a spherical triangle.

9. What is a fathometer?

10. Differentiate between 'tilted photograph' and 'oblique photograph'.

PART B — (5 × 16 = 80 marks)

11. (a) (i) You are given a theodolite fitted with stadia hairs, the object glass of telescope being known to have a focal length of 230 mm and to be at a distance of 138 mm from the trunnion axis. You are told that the multiplying constant for the instrument is believed to be 180. The following Tacheometric readings are then taken from an instrument station A, the reduced level of which is 15.05 m. (10)

Instrument at	Height of Instrument (m)	Sight to	Vertical angle	Stadia Readings	Remarks
A	1.380	B	+ 30°	1.225/ 1.422/ 1.620	Staff held Vertical RL of B = 40.940 m
A	1.380	C	+ 45°	1.032/ 1.181/ 1.330	Staff held normal to line of sight

Find the distance AB, AC and Reduced level of C.

(ii) Explain how you will obtain in the field, the constants of a tacheometer. (6)

Or

(b) (i) The vertical angles to vanes fixed at 1 m and 3 m above the foot of staff held vertically at a station A were 03° 10' and 05° 24' respectively. Find the horizontal distance and the reduced level of A if the height of the instrument axis is 138.556 m above datum. (6)

(ii) A tacheometer was set up at station A and the following readings were obtained on a vertically held staff. (10)

Instrument Station	Staff station	Vertical angle	Stadia hair readings	Remarks
A	B.M.	– 02°18'	3.225, 3.550, 3.875	R.L. of B.M. = 425.515 m
A	B	+08°36'	1.650, 2.515, 3.380	

Find the distance between A and B, R.L. of B.

12. (a) (i) A steel tape of nominal length 30 m was suspended between two supports to measure the length of a line. The measured length on a slope of 04°25' is 29.861 m. The mean temperature during measurement was 15° C and pull applied was 120 N. If standard length of the tape was 30.008 m at 27°C and the standard pull of 50 N, calculate the correct horizontal length. Take the weight of the tape as 0.16 N m^{-1}, its cross sectional area equal to 2.75 mm^2 coefficient of linear thermal expansion = 1.2 × 10^{-5} per degree Celsius and E = 2.05 × 10^5 N mm^{-2}. (12)

(ii) Enumerate the points to be borne in mind while selecting the triangular stations. (4)

Or

(b) (i) Two stations P and Q are 81 km apart. They are situated on either side of a sea. The instrument axis at P is 39 m above MSL. The elevation of Q is 207 m above MSL. Calculate the minimum height of the signal at Q. The coefficient of refraction is 0.08 and the mean radius of earth is 6370 km. (10)

(ii) Briefly explain the following :

(1) Satellite stations

(2) Phase of a signal. (2 × 3 = 6)

13. (a) Some leveling were carried out with the following results.

	Rise or Fall	Weight
P to Q	+ 4.32 m	1
Q to R	+ 3.17 m	1
R to S	+ 2.59 m	1
S to P	– 10.04 m	1
Q to S	+ 5.68 m	2

The R.L. of P is known to be 131.31 m above datum. Determine the probable levels of other points. (16)

Or

(b) (i) Explain in brief the difference between 'standard error' and 'Probable error'. (6)

(ii) The following are the mean values observed in the measurement of three angles $\angle A$, $\angle B$ and $\angle C$ at a station.

$\angle A$	=	76° 42' 46.2"	Weight 4
$\angle A + \angle B$	=	134° 36' 32.6"	Weight 3
$\angle B + \angle C$	=	185° 35' 24.8"	Weight 2
$\angle A + \angle B + \angle C$	=	262° 18' 10.4"	Weight 1

Calculate the most probable value of each angle using normal equation. (10)

14. (a) (i) With the help of a sketch, explain the construction of an astronomical triangle. Obtain the relations existing amongst the spherical coordinates. (8)

(ii) Find the GMT corresponding to the LMT $9^h\ 40^m\ 12^s$ A.M. at a place in longitude 42° 36' W. (4)

(iii) Derive an expression for correction for refraction to be applied to the observed or apparent altitudes of the celestial bodies. (4)

Or

(b) (i) The mean observed altitude of the sun, corrected for refraction, parallax and level was 36°14'16.8" at a place in latitude 36°40'30" N and longitude 56°24'12" E. The mean watch time of observation was $15^h\ 49^m\ 12.6^s$, the watch being known to be about 3^m fast on LMT. Find the watch error given the following :

Declination of sun at the instant of observation = + 17°26'42.1"

GMT of GAN = $11^h\ 56^m\ 22.8^s$ (8)

(ii) Find the azimuth of the line QR from the following ex-meridian observations for azimuth.

	Object	Face	Altitude Level	
			O	E
1	Q	L	–	–
2	Sun	L	5.4	4.6
3	Sun	R	5.2	4.8
4	R	R	–	–
	Horizontal Circle		Vertical Circle	
	A	B	C	D
1	30°12'20"	210°12'10"	–	–
2	112°20'30"	292°20'20"	24°30'20"	24°30'40"
3	293°40'40"	113°40'30"	25°00'00"	25°01'00"
4	211°50'30"	31°50'20"	–	–

Latitude of station Q = 36°48'30" N
Longitude of station Q = $4^h\ 12^m\ 32^s$ E
Declination of the sun at GMN = 01°32'16.8" N decreasing at 56.2" per hour
Mean of LMT of two observations = $4^h\ 15^m\ 30^s$ P.M. by watch
Watch running 4^s slow at noon, gaining 0.8^s per day
Value of level division = 15"
Correction for horizontal parallax = 8.76"
Correction for refraction = 57" cot (apparent altitude) (8)

15. (a) (i) With the help of suitable sketches, explain the following methods of locating soundings.
(1) Location by range and one angle from the shore
(2) Location by two angles from the shore (2 × 4 = 8)

(ii) A camera having focal length of 20 cm is used to take a vertical photograph of a terrain having an average elevation of 1500 m. What is the height above sea level at which an aircraft must fly in order to get the scale of 1 : 8000? (4)

(iii) The scale of an aerial photograph is 1 cm = 100 m. The photograph size is 20 cm × 20 cm. Determine the number of photographs required to cover an area of 100 sq. km if the longitudinal overlap is 60% and the side lap is 30%. (4)

Or

(b) (i) Explain the principle underlying "Electronic Distance Measurement". Write a note on errors in EDM. (8)

(ii) Given the three shore signals A, B and C and the angles α and β subtended by AP, BP and CP at the boat P, it is required to plot the position of P (refer Figure below). How will you obtain the position of P using a Station pointer? (8)