

B.Tech 5th Semester Exam., 2017

ADVANCED SURVEYING

Time : 3 hours

Full Marks : 70

Instructions :

- (i) The marks are indicated in the right-hand margin.
- (ii) There are **NINE** questions in this paper.
- (iii) Attempt **FIVE** questions in all.
- (iv) Question No. 1 is compulsory.

1. Choose the correct answer of the following
(any seven) : 2×7=14

- (a) Setting out a simple curve by the two-theodolite method does not require
- (i) angular measurements
 - (ii) linear measurements
 - (iii) both angular and linear measurements
 - (iv) None of the above

- (b) Overturning of vehicle on a curve can be avoided by using a
- (i) compound curve
 - (ii) vertical curve
 - (iii) reverse curve
 - (iv) transition curve
- (c) Shift of curve is
- (i) $L^2/6R$
 - (ii) $L^2/14R$
 - (iii) $L^2/24R$
 - (iv) $L/24R$
- (d) The pattern wavelength employed by various EDM instruments is maximum for
- (i) Tellurometer
 - (ii) Geodimeter
 - (iii) Distomat
 - (iv) Makenometer
- (e) Zero correction in EDM instruments corresponds to the
- (i) difference of final and initial readings
 - (ii) delay of EDM signal
 - (iii) difference of distance travelled by electromagnetic waves and the direct distance between the point of arrival of signal and centering mark
 - (iv) calibration error

- (f) In triangulation survey, the indivisibility of stations can be checked by
- method of least squares
 - heliotropes
 - Captain G. T. McCaw's solution
 - three-point problem
- (g) For the star to the west of meridian, the local sidereal time is given by
- $LST = RA + HA$
 - $LST = RA - HA$
 - $LST = RA \pm HA$
 - $LST = RA + \text{declination}$
- (h) If S is the sum of three angles of a spherical triangle, then the spherical excess equals
- $S - 90^\circ$
 - $S - 180^\circ$
 - $S - 270^\circ$
 - $S - 360^\circ$
- (i) The purpose of making hydrographic survey is
- to determine the quantities of subaqueous excavations
 - to measure areas subjected to scouring and silting in harbours
 - to measure soundings and preparing navigation charts
 - All of the above

- (j) Log sine correction is made in triangulation to satisfy
- apex condition
 - opposite angles
 - side condition
 - peripheral sum
2. (a) Explain briefly the principle underlying electronic distance measurement. 7
- (b) How can ambiguity in phase delay be eliminated? 7
3. (a) What are the practical uses of astronomical surveying? 6
- (b) A star was observed for time by equal altitude when it was on the prime vertical at a place in latitude $34^\circ 30' N$. The declination of the star was $+20^\circ 30'$ and its right ascension 16 h 51 m 52 s. Determine the altitude when on the prime vertical and the LST of prime vertical transit. 8
4. (a) What is the three-point problem in hydrographic surveying? Show with the help of neat sketches, how it is solved mechanically. 7

(b) Calculate the discharge of a stream given the following current-meter data : 7

Distance across from one bank (m)	0	10	20	30	40	50	60	70
Depth of bed (m)	0	0.50	1	1.50	2	1.50	1	0
Velocity of flow at 0.6 m depth (m/s)	0	0.20	0.25	0.30	0.33	0.30	0.20	0

5. (a) Explain the term axis-signal correction as used in trigonometrical levelling. 5

(b) Find the reduced level of station S from the following observations. The horizontal distance from R to S is 8888 m, the angle of elevation from R to S is $2^{\circ}5'20''$, the height of signal at S is 3.88 m, the height of the instrument at R is 1.31 m, the coefficient of refraction is 0.07, RS in $1'' = 30.8$ m, where R is earth's mean radius and RL of R is 415.500 m. 9

6. The following observations of three angles A, B and C were taken at a triangulation station :

Observations	Weights
$A = 72^{\circ}12'42.5''$	3
$B = 53^{\circ}18'53.6''$	4
$C = 110^{\circ}24'48.5''$	2
$A + B = 125^{\circ}31'36.8''$	2
$B + C = 163^{\circ}43'44.6''$	2
$A + B + C = 235^{\circ}56'26.2''$	1

Determine the most probable values of the angles. 14

7. (a) Briefly explain the terms of the following : 6

- Satellite station
- The phase of a signal
- Heliotrope

(b) During the reconnaissance of a hilly part of the country for geodetic surveying, the following information was obtained regarding the profile of intervening ground between stations P and Q, the distance PQ being 120 km. The elevations above mean sea level are $P = 210$ m, $Q = 1050$ m, $L = 330$ m and $M = 557$ m. Peaks L and M are situated in the line PQ such that $PL = 50$ km and $PM = 80$ km. Determine whether P and Q are intervisible and if necessary, find the minimum height of the scaffolding at Q, assuming P as the ground station. The line of sights is to clear the peaks by at least 3 m. 8

8. (a) Deduce the relationship between the degree and radius of a curve. 5

(b) A highway curve which deflects through 80° is to be designated for a maximum speed of 100 kmph, a maximum centrifugal ratio of $\frac{1}{4}$ and a maximum

rate of change of acceleration of 0.3 m/s^3 . The curve consists of a circular arc with two cubic spirals at the ends. Calculate the radius of the circular arc, the length of the transition, the total length of the combined curve and the chainages of all salient points if that of the intersection is 4200 m. 9

9 (a) When would you use a vertical curve? What are the different types of vertical curves? How would you compute the length of a vertical curve? 5

(b) An upgrade of 1% joins a downgrade of 0.5% at a point of chainage 885 m. The RL of this point is 140.250 m. Calculate the chainage of the beginning and end of a suitable vertical curve to join these gradients and determine the reduced levels of points on the curve at 30 m intervals. 9
