

## B.Tech. 5th Semester Exam., 2013

## ADVANCED SURVEYING

Time : 3 hours

Full Marks : 70

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- (i) All questions carry equal marks.  
(ii) There are **NINE** questions in this paper.  
(iii) Attempt **FIVE** questions in all.  
(iv) Question No. 1 is compulsory.

1. Choose the correct option (any seven) :

- (a) The best method of laying a curve is by  
(i) tacheometer akubihar.com  
(ii) two theodolites  
(iii) deflection distances  
(iv) offsets from the tangents produced
- (b) A parabola is best suited for a vertical curve since  
(i) it provides a longer sight distance  
(ii) rate of change of grade is uniform throughout  
(iii) smooth riding condition is provided  
(iv) All of the above

(c) Shift of a curve is

(i)  $\frac{L^2}{6R}$

(ii)  $\frac{L}{24R}$

(iii)  $\frac{L^2}{24R}$

(iv)  $\frac{L}{6R}$

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(d) An ideal transition curve is

(i) cubic parabola

(ii) cubic spiral

(iii) parabola

(iv) true spiral

(e) The process of determining the elevations of stations from vertical angles and geodetic lengths at mean sea level is known as

(i) levelling

 (ii) trigonometric levelling

(iii) triangulation

(iv) hypsometry

(f) The best shape of a triangle in triangulation is

(i) equilateral

 (ii) isosceles with base angle  $56^\circ 14'$ (iii) isosceles with base angle  $65^\circ 14'$ (iv) isosceles with base angle  $60^\circ$

- (g) Tellurometer is an instrument used for
- GPS
  - EMR
  - GTS
  - ~~(iv)~~ EDM
- (h) The weight of an angle  $\alpha$  is 2. The weight of  $2\alpha$  will be
- $\frac{2}{2}$
  - $\frac{2^2}{2}$
  - $\frac{2}{\sqrt{2}}$
  - ~~(iv)~~  $\frac{2}{2^2}$
- (i) The unit of sounding is
- m/s
  - $\text{cm}^2/\text{s}$
  - ~~(iii)~~ fathom
  - cycles/sec
- (j) A star culminates in zenith when
- $\delta < \theta$
  - $\delta > \theta$
  - $\delta \leq \theta$
  - ~~(iv)~~  $\delta = \theta$

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2. (a) What is shift? Prove that a transition curve bisects a shift and that a shift bisects a transition curve.
- (b) The alignment of a road is as follows :

Line	WCB	Length (m)
AB	$30^\circ 0'$	250
BC	$90^\circ 0'$	150
CD	$140^\circ 0'$	325

These three lines are to be connected by a single-circular curve. Find the radius and tangent length.

3. In a road alignment, a grade of  $-1.0\%$  is followed one of  $+0.5\%$ . The chainage and RL of the intersection point are 400 m and 250 m respectively. The rate of change of grade is  $0.1\%$  per 20 m. Calculate the necessary data for setting out the vertical curve, taking a peg interval of 30 m.
4. The following mean values of the three angles of a triangle were observed :
- |                                   |            |
|-----------------------------------|------------|
| $\angle A = 54^\circ 12' 25''$    | Weight = 8 |
| $\angle B = 48^\circ 46' 16.25''$ | Weight = 4 |
| $\angle C = 77^\circ 02' 10.83''$ | Weight = 6 |
- Determine the corrected values of the angles by the method of least squares.

5. (a) List the major components of electromagnetic spectrum and the use of each type of radiation.
- (b) What are the applications of electronic distance measurement? What are the main classes of EDM instruments?
6. (a) Explain briefly the various types of signals giving their merits and demerits.
- (b) A base line was measured in four catenary lengths of 30.126 m, 29.98 m, 30.06 m and 24.56 m. The difference of levels was respectively 0.45 m, 0.55 m, 0.40 m and 0.5 m. The temperature during observation was 12 °C and the straining mass was 15 kg. The tape was standardized as 30 m at 22 °C with a straining mass of 5 kg. The coefficient of expansion was  $0.000011/^\circ\text{C}$ , the mass of tape = 1kg, cross-sectional area =  $3 \text{ mm}^2$ ,  $E = 210 \times 10^3 \text{ N/mm}^2$  and  $g = 9.81 \text{ m/s}^2$ . Calculate the length of the base.
7. (a) Define sounding and state the equipment and personal used for locating and making soundings. What is meant by reduction of sounding?
- (b) From the boat O offshore readings were taken to three shore signals A, B and C with the help of sextant. The angles AOB and BOC were  $32^\circ 30'$  and  $62^\circ 30'$  respectively. The distances AB and BC were measured to be 360 m and 615 m respectively and the angle ABC on the landward side was  $233^\circ 30'$ . Determine the distance of the boat from the signal B.

8. (a) What do you understand by the following?  
Aphetion, Equinox, Solstice,  
Ecliptic, Sidereal time
- (b) The attitude of a star at the upper culmination is  $72^\circ 30'$  and that at the lower culmination is  $20^\circ 30'$ , both the culminations being to the north side of the zenith of the place. Determine the declination and the latitude of the observer.
9. It is required to determine the elevation of a station O. Observations were made to three stations A, B and C already fixed and of known elevations. The following data was recorded :

Instrument station	Station observed	Height of instrument (m)	Distance (m)
O	A		3600
H <sub>8</sub>	B	1.50	4700
I <sub>9</sub>	C		5000
T <sub>20</sub>		Height of signal (m)	Vertical angle
f <sub>6</sub>		5.6	$1^\circ 20''$
		4.1	$-53' 00''$
		4.9	$-34' 10''$

The reduced level of A, B and C were 294 m, 159.5 m and 181 m respectively. Take  $m = 0.07$  and  $RS$  in  $1'' = 30.88 \text{ m}$ .

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