Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech(CE)/SEM-4/CE-403/2010

2010

SURVEYING – II

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

   i) The number of horizontal cross wires in a stadia diaphragm is

   a) one b) two

   c) three d) four.

   ii) For a tacheometer the additive and multiplying constants are respectively

   a) 0 and 100 b) 100 and 0

   c) 0 and 0 d) 100 and 100.

   iii) Overturning of vehicles on a curve can be avoided by using

   a) compound curve b) vertical curve

   c) reverse curve d) transition curve.

iv) Different grades are joined together by a

a) compound curve b) transition curve

c) reverse curve d) vertical curve.

v) If the degree of a curve is 1°, then radius of the curve is equal to

a) 5400 m b) 1720 m

c) 1720/∏ m d) 3440/∏ m.

vi) The length of the long chord of a simple circular curve of radius R and angle of deflection A is

a) $R \cos (A /2)$ b) $2R \cos (A /2)$

c) $2R \sin (A /2)$ d) $R \sin (A /2)$.

vii) Setting out a simple curve by two-theodolite method does not require

a) angular measurements

b) linear measurements

c) both angular and linear measurements

d) none of these.

viii) The shape of the vertical curve generally provided is

a) circular b) parabolic

c) spiral d) elliptical.

ix) The maximum value of centrifugal ratio on roads and railways respectively are taken as

a) $\frac{1}{4}$ and $\frac{1}{6}$ b) $\frac{1}{6}$ and $\frac{1}{8}$

c) $\frac{1}{4}$ and $\frac{1}{8}$ d) $\frac{1}{8}$ and $\frac{1}{4}$.

x) Agonic line is the line joining points having

a) zero declination b) minimum declination

c) maximum declination d) same declination.

xi) The tilt displacement in an aerial photograph is radial from

a) plumb point b) isocentre point

c) principal point d) Nadir point.

xii) To determine the length of a bridge proposed to be built across a wide river, the surveying method of choice would be

a) tachometry

b) chain surveying

c) hydrographic surveying

d) triangulation.

xiii) Perpendicular offset from the junction of transition curve and circular curve to the tangent is equal to

a) shift b) two times the shift

c) three times the shift d) four times the shift.

xiv) The length of the tangent of a curve of radius R and angle of deflection A is given by

a) $R \cos (A/2)$ b) $R \tan (A/2)$

c) $R \sin (A/2)$ d) $R \cot (A/2)$.

GROUP – B
(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. How can you measure horizontal angle by the method of repetition using a theodolite ?
3. Derive an expression for the reduced level of the staff station when the line of sight is inclined downwards with the staff held vertically using the fixed hair method of tacheometry.
4. Explain Bowditch rule in connection to error distribution in a traverse.
5. Derive the basic equation of tacheometry using the theory of anallatic lens.
6. Classify different types of curves. What is reverse curve ? Where is it used ? 2 + 2 + 1
7. Write short notes on the following : $2 \times 2\frac{1}{2}$

   a) Shore line survey

   b) Remote sensing and its applications.

GROUP – C
(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

8. A traverse data given in the table below contain length and interior angles of traverse PQRST. The bearing of the line PQ was observed and recorded as S 36° 12′ 30″ E. Check the traverse for angles and closing errors, if any. Find the correct latitude and departures by the correction method appropriate for theodolite traverse. Neatly represent the traverse in the format of Gayle's traverse table. Show required calculations and diagrams separately where necessary.

Line	***Length***	***Station***	***Included angles***
PQ	102·8	*P*	131° 14′ 30″
QR	98·4	*Q*	84° 19′ 25″
RS	110·8	*R*	116° 35′ 25″
ST	82·8	*S*	119° 58′ 05″
TP	113·29	*T*	87° 54′ 05″

15

9. a) To ascertain horizontal distance and R.L. of 2 inaccessible points P and Q on top of hill, the following observations were made with a theodolite from ends of a base line AB, 180 m long :

$\angle PAB = 90°$, $\angle QBA = 75°$ and $\angle QAB = 45°$. Angle of elevation to P from A is 240 and that of Q from A = 180. Determine horizontal distance PQ and difference of elevation between P and Q.

b) For determination of height of a chimney a theodolite was kept at two stations A and B, 200 m apart, A being nearer to the chimney. The readings at the BM (of RL 1020.375) were 1.35 from station A and 2.15 m from B. The vertical angles to the top of chimney were 19° 30′ and 9° 15′ from stations A and B, respectively. Find the horizontal distance and RL of top of chimney. 7 + 8

10. Write short notes on any *three* of the following : 3 ∞ 5

a) Temporary adjustments in theodolite

b) Significance of face left and face right observation in angular measurements.

c) Station adjustment

d) Methods of plotting theodolite

e) Transit rule.

11. a) As chaining was not possible, a traverse was conducted using tacheometry. The line of sight was horizontal in all cases. The data obtained is represented in the following table. Find the lengths of the sides and the length and bearing of line *AC*. Find the gradient from *A* to *C* if the reading on a staff held at BM is 2·415 m from *A* and 0·645 m from *C*. The instrument constants were 100 and 0·3.

Line	***Bearing***	***Instrument at***	***Staff at***	***Cross hair readings***
AB	70° 30′	*A*	*B*	1·535, 2·214, 2·893
BC	120° 45′		*D*	2·018, 2·70, 3·708
CD	223° 30′		*C*	
DA	320° 47′	*C*	*B*	1·033, 1·733, 2·432
			D	1·363, 2·243, 3·123
			A	

OR

Elevation of point *P* is to be determined by observations from two adjacent stations of a tacheometric survey. The staff was held vertically upon the point and the instrument is fitted within an anallatic lens, the constant of the instrument being 100. Compute the elevation of point *P* from the following data, taking both observations as equally trustworthy.

Inst. station	***Height of axis***	***Staff at***	***Vertical angle***	***Staff reading***	***Elevation of station***
A	1·42 m	*P*	+ 2° 24′	1·230, 2·055, 2.880	77·750 m
B	1·40 m	*P*	– 3° 36′	0·785, 1·800, 2·815	97·135 m

Also calculate the distance of *A* and *B* from *P*.

b) Two sets of tacheometric readings were taken from instrument station *A*, the *RL* of which was 100·06 m to a staff station *B*.

i) Instrument *P*-multiplying constant = 100, additive constant = 0·06, staff held vertical.

ii) Instrument *Q*-multiplying constant = 90, additive constant = 0·06, staff held normal to the line of sight.

Instrument name	***Instrument at***	***Sighted to***	***HI in m***	***Vertical angle***	***Stadia readings in m***
P	*A*	*B*	1·5	26	0·755, 1·005, 1·255
Q	*A*	*B*	1·45	26	?

What should be the stadia readings with instrument *Q* ?

7 + 8

12. a) Derive the mathematical expression for three-point method for locating sounding station in the context of hydrographic survey.

b) In order to locate the position of a sounding boat S_1, observations were made to three points, *A*, *B* and *C* on the shore. The observed values are as follows :

$AS_1B = 50° 56'$

$BS_1C = 27° 23'$

From the map *AB* is scaled as 343·30 m and *BC* as 220·00 m. The angle *ABC* was found to be 163° 18′. What are the distances of S_1 from *A* and *B* ? 6 + 9

13. a) Explain the concept of degree of a curve with relevant mathematical expressions.

b) Derive the mathematical expressions for setting out a simple circular curve for the methods involving radial and perpendicular offsets from tangents.

c) A curve of radius 300 m has a defection angle of 30°. Calculate and tabulate the radial and perpendicular offsets from the tangent to locate points on the curve. The number of offsets should be such that the offset length is less than 20 m. 3 + 6 + 6