

**II B.Tech II Semester Supplementary Examinations, Nov/Dec 2005**  
**SURVEYING-II**  
**(Civil Engineering)**

**Time: 3 hours****Max Marks: 80**

**Answer any FIVE Questions**  
**All Questions carry equal marks**

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1. (a) Explain the detailed procedure, about the measurement of horizontal angle by using theodolite. [10+6]  
 (b) What are the fundamental lines for a transit?

2. (a) What are the different methods of adjusting a traverse in Gales system? Explain one of the rules in detail. [8+8]

- (b) The bearing of two inaccessible stations 'A' and 'B' taken from station 'C' were  $225^{\circ}00'$  and  $153^{\circ}26'$  respectively. The coordinates of 'A' and 'B' were as under

Station	Easting	Northing
A	300	200
B	400	150

Calculate the independent coordinates of 'C'.

3. (a) Describe the conditions under which tacheometric surveying is advantageous. [4+6+6]

- (b) Staff readings observed with a percentage theodolite corresponding to angles of elevation of 4% and 5% are 1.525 and 2.925 respectively. If the vertical angle on sighting the staff reading equal to the height of the trunnion axis above the ground was 4.5%. Calculate

- i. the horizontal distance between the instrument and the staff
- ii. the elevation of the staff station if that of the instrument station was 493.700

4. (a) Describe a method of setting out a simple circular curve with the help of chain and tape only. [8+8]

- (b) Two parallel railway lines are to be connected by a reverse curve, each section having the same radius. If the lines are 10 m apart and the maximum distance between tangent points measured parallel to the straights is 40 m. Find the maximum allowable radius. If however, both the radii are different, calculate the radius of the second branch if that of the 1<sup>st</sup> branch is 50m. Also calculate lengths of both branches.

5. Derive an expression for the length and shift of a transition curve required for a first-class railway track. [8+8]

6. Two stations A and B were 1800.50 m distance apart. Reciprocal observations were made to determine the difference of level between them. The following data was

recorded: [16]

Height of instrument at A = 1.463 m

Height of instrument at B = 1.457 m

Height of signal at A = 1.647 m

Height of signal at B = 1.762 m

Vertical angle from A to B =  $+1^{\circ}42'2''$

Vertical angle from B to A =  $-1^{\circ}41'46''$

Calculate also the height of B above A, using the vertical angle from A only. Assume the coefficient of refraction as 0.07. Prove the formula used.

7. (a) What is meant by 'base net' ? Explain how you would extend base line. [8+8]

(b) Explain how you would prolong a given base line.

8. Adjust the angles  $\alpha$  and  $\beta$ , observations of which give [16]

$\alpha = 20^{\circ} 10' 10''$  weight 6

$\beta = 30^{\circ} 20' 30''$  weight 4

$\alpha + \beta = 50^{\circ} 30' 50''$  weight 2

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1. (a) Explain how you will run a straight line between two points in the following cases [8+8]
  - i. Both ends intervisible.
  - ii. Both ends are not intervisible from any intermediate point.
- (b) With two theodolites, how an intersection point of two straight lines is located.
2. (a) A man travels from a point A to due to west and reaches the point B. The distance between A and B = 139.6 m. Calculate the latitude and departure of the line AB. [8+8]
- (b) For the following traverse, find the length of DE so that A, E and F may be in the same straight line.

Line	Length(m)	Reduced Bearing
AB	200	S 84°30' E
BC	100	N 75°18' E
CD	80	N 18°45' E
DE	?	N 29°45' E
EF	150	N 64°10' E

3. (a) Derive the fundamental equation of tangential tacheometry. [8+8]
- (b) The following readings were taken with a tacheometer on a vertical staff

Stadia readings	Vertical angle	Horizontal distance
0.795, 1.025, 1.255	0°	46.236 m
1.875, 2.180, 2.485	5°	60.780 m

Determine the constants of the tacheometer.

4. (a) What are the different elements of a simple curve. With the help of neat sketches, derive the expressions for the elements of a simple curve. [8+8]
- (b) A Railway siding is to be curved through a right angle and in order to avoid buildings. The curve is to be compound, and radii of the two branches are 240 m and 360 m. The distance from the intersection point of the end straight to the tangent point at which the 240 m radius curve leaves the straight is 300 m. Obtain the second tangent length of whole curve.

5. On the basis of preliminary survey, it was proposed to connect two straights, having deflection angle of  $112^\circ$  by a circular curve of 400 metres radius, and the direction of both the tangents were set out in the field. However, while setting out the curve, it was thought desirable to change the radius to 450 metres without changing the direction of the forward tangent. Calculate the distance by which the forward tangent must be shifted parallel to itself so that the point of curvature (P.c.) remains unaltered. [16]
6. The following reciprocal observations were made from two points: P and Q : [16]
- |                                     |                     |
|-------------------------------------|---------------------|
| Horizontal distance between P and Q | = 4860 m            |
| Angle of elevation of Q at P        | = $1^\circ 5' 21''$ |
| Angle of depression of P at Q       | = $1^\circ 0' 50''$ |
| Height of instrument at P           | = 1.35 m            |
| Height of signal at P               | = 6.10 m            |
| Height of instrument at Q           | = 1.38 m            |
| Height of signal at Q               | = 6.21 m            |

Find the difference in level between P and Q and the co-efficient of refraction. Take  $R \sin 1'' = 30.88 \text{ m}$

7. (a) Discuss in brief how you would conduct reconnaissance for a triangulation. [8+8]
- (b) What is satellite station? How would you reduce the horizontal angles?
8. Adjust the angles  $\alpha$  and  $\beta$ , observations of which give [16]
- |                                      |          |
|--------------------------------------|----------|
| $\alpha = 20^\circ 10' 10''$         | weight 6 |
| $\beta = 30^\circ 20' 30''$          | weight 4 |
| $\alpha + \beta = 50^\circ 30' 50''$ | weight 2 |

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1. (a) Two stations at elevations of  $\alpha$  and  $\beta$  are sighted by a theodolite in which the line of collimation is inclined to the trunnion axis at an angle  $(90^\circ - e)$ , where 'e' is small. [9+7]
  - i. Derive an expression for the error in the horizontal angle between the two stations as given by the instrument.
  - ii. Show by a diagram the effect of the collimation error on the vertical circle reading of one station.
  - iii. What is the effect of measuring the horizontal and vertical angles on both faces?
- (b) In a straight line ABC, AB measure 354.384 m, BC measures 282.092 m and AC measures 636.318 m using a particular EDM reflector combination. A line measures 533.452 m with this instrument reflector combination. What is the correct length of the line?
2. (a) A man travels from a point A to due to west and reaches the point B. The distance between A and B = 139.6 m. Calculate the latitude and departure of the line AB. [8+8]
- (b) For the following traverse, find the length of DE so that A, E and F may be in the same straight line.

Line	Length(m)	Reduced Bearing
AB	200	S $84^\circ 30'$ E
BC	100	N $75^\circ 18'$ E
CD	80	N $18^\circ 45'$ E
DE	?	N $29^\circ 45'$ E
EF	150	N $64^\circ 10'$ E

3. (a) Briefly discuss about errors in tacheometry. [6+10]
- (b) Stadia readings were taken with a theodolite on a vertical staff with the telescope inclined at an angle of  $3^\circ 30'$ . The staff readings were 2.990, 2.055 and 1.120. The reduced level of the staff station is 100.000 and the height of the instrument is 1.50 m. What is the reduced level of the ground at the instrument.
4. (a) What are the different elements of a simple curve. With the help of neat sketches, derive the expressions for the elements of a simple curve. [8+8]

- (b) A Railway siding is to be curved through a right angle and in order to avoid buildings. The curve is to be compound, and radii of the two branches are 240 m and 360 m. The distance from the intersection point of the end straight to the tangent point at which the 240 m radius curve leaves the straight is 300 m. Obtain the second tangent length of whole curve.
5. A transition curve is required for a circular curve of 400 m radius, the gauge being 1.5 m between rail centre and maximum super-elevation restricted to 12 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 the radial acceleration is  $30 \text{ cm/sec}^3$ . Calculate the required length of transition curve and the design speed. [16]
6. Two stations A and B are 16.44 km apart. The following data was recorded: [16]
- |   |                   |
|---|-------------------|
| Instrument at A, angle of depression to B | = $3^{\circ}42''$ |
| Instrument at B, angle of depression to A | = $2^{\circ}04''$ |
| Height of instrument at A                 | = 1.42 m          |
| Height of instrument at B                 | = 1.42 m          |
| Height of signal at A                     | = 5.53 m          |
| Height of signal at B                     | = 5.53 m          |
| R sin $1''$                               | = 30.88 m         |
- Find the difference in level between A and B and the coefficient of refraction at the time of observation
7. Show that in base line measurement with tapes and wires in flat catenary with supports at different levels, the total correction will be  $-(x + c)$ , where  $x$  is the parabolic approximation for sag between the level support and  $c$ , the level or slope correction taken permissibly to the first approximation'. [16]
8. Adjust the angles  $\alpha$  and  $\beta$ , observations of which give [16]
- |  |          |
|--|----------|
| $\alpha = 20^{\circ} 10' 10''$         | weight 6 |
| $\beta = 30^{\circ} 20' 30''$          | weight 4 |
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1. (a) Explain the detailed procedure, about the measurement of vertical angle by using theodolite. [10+6]  
 (b) After performing the temporary adjustments of a theodolite it was found that, the vertical circle reading is not found to be exactly zero when the telescope is horizontal. How do you measure vertical angles correctly in such a case?
2. (a) Write the various steps that are usually necessary for Gales Traverse table computation. [6+10]  
 (b) The bearings of two inaccessible stations A and B taken from station C were  $225^{\circ} 00'$  and  $153^{\circ} 20'$  respectively. The coordinates of A and B were as under:

Station	Easting	Northing
A	300	200
B	400	150

Calculate the Independent co-ordinates of C.

3. (a) Describe the conditions under which tacheometric surveying is advantageous. [4+6+6]  
 (b) Staff readings observed with a percentage theodolite corresponding to angles of elevation of 4% and 5% are 1.525 and 2.925 respectively. If the vertical angle on sighting the staff reading equal to the height of the trunnion axis above the ground was 4.5%. Calculate
  - i. the horizontal distance between the instrument and the staff
  - ii. the elevation of the staff station if that of the instrument station was 493.700
4. (a) How will you set out a circular curve with a chain and a theodolite by method of tangential deflections? [8+8]  
 (b) A reverse curve having two branches of common radius is to connect two parallel straights 9 m apart. If the distance between the tangent points is 72 m, find the necessary radius.
5. Derive an expression for the length and shift of a transition curve required for a first-class railway track. [8+8]
6. In trigonometrically measurement of the difference in level of two stations P and Q, 61760 m apart, the following data were obtained: [16]  
 Instrument at P, angle of elevation of Q =  $0^{\circ} 32'$

Find the difference in level between P and Q, and the curvature and refraction Corrections. Take  $R \sin 1' = 30.88 \text{ m}$ .

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