Enrollment No......................................

Faculty of Engineering
End Sem (Odd) Examination Dec-2019
CE3CO01 Engineering Surveying

Programme: B.Tech.   Branch/Specialisation: CE

Duration: 3 Hrs.   **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1   i.   The operation of making the algebraic sum of latitudes and   **1**
           departures of a closed traverse, each equal to zero, is known
           (a) Balancing the sights   (b) Balancing the departures
           (c) Balancing the latitudes   (d) Balancing the traverse

      ii.   Size of a theodolite is specified by   **1**
            (a) The length of telescope
            (b) The diameter of vertical circle
            (c) The diameter of lower plate
            (d) The diameter of upper plate

      iii. One of the tacheometric constants is additive, the other constant, is   **1**
            (a) Subtractive constant   (b) Dividing constant
            (c) Multiplying constant   (d) Indicative constant

      iv.   The diaphragm of a stadia theodolite is fitted with two additional   **1**
            (a) Horizontal hairs   (b) Horizontal and two vertical hairs
            (c) Vertical hairs   (d) None of these

      v.   An ideal transition curve is   **1**
            (a) Cubic parabola   (b) Clothoid spiral
            (c) Cubic spiral   (d) True spiral.

      vi.   For setting out a simple curve, using two theodolites.   **1**
            (a) Offsets from tangents are required
            (b) Offsets from chord produced are required
            (c) Offsets from long chord are required
            (d) None of these

      vii. For a well-conditioned triangle, no angle should be less than   **1**
            (a) 20º   (b) 30º   (c) 45º   (d) 60º

P.T.O.

viii. The necessary geometrical condition for triangulation adjustment, is **1**
(a) The sum of the angles around a station should be 360°
(b) The sum of the three angles of a plane triangle should be 180°
(c) The sum of the eight angles of a braced quadrilateral should be 360°
(d) All of these

ix. The height displacement on a vertical photograph **1**
(a) Increases as the horizontal distance increases from the principal point
(b) Increases as the ground elevation increases
(c) Decreases as the flying height increases
(d) All of these

x. An aerial photograph may be assumed as **1**
(a) Parallel projection   (b) Orthogonal projection
(c) Central projection   (d) None of these.

Q.2   i. What is closing error in a traverse? Explain the Bowditch's method of adjusting a closing error. **4**

ii. The following lengths and bearings were recorded in running a compass traverse ABCD. There are obstacles which prevent direct measurement of bearing and length of line AD. **6**

Line	Length in m	Bearing
AB	485	342°
BC	1720	16°
CD	1050	140°

Calculate the length and bearing of AD.

OR   iii. The following observations were made on a hilltop to ascertain its elevation, with height of target above the hill is 3.8m. **6**

Instrument station	Staff reading on BM	Angle of elevation to target
A	1.830	26°36'
B	3.150	16°38'

RL of bench mark was 400.00 m. The instrument stations were 120m apart and were in line with target.

Q.3   i. What are the advantages of tacheometric surveying? **2**

ii. With usual notations, explain the tangential method of tacheometry when **8**
(a) Both angles are angle of elevation
(b) Both angles are angles of depression.

OR   iii. Explain in detail the use of anallactic lens in external-focussing telescope used in tacheometry. What are its advantages and disadvantages? **8**

Q.4   i. Find the relationship between the degree of a curve and its radius. **4**

ii. Mention the various methods of setting out a simple curve. Explain the method of successive bisection of chords. **6**

OR   iii. Explain briefly the various methods of determining the length of a transition curve. **6**

Q.5   i. How are the triangulation systems classified? Indicate the use of each system. **4**

ii. Name the various corrections to be applied to a measured base line. Give expression for their nature and magnitudes. **6**

OR   iii. What are the requirements of a site selected for a baseline in triangulation survey? What equipment are necessary to measure a base line accurately? **6**

Q.6   Attempt any two:

i. Define the following from photographic surveying **5**
(a) Picture plane   (b) Principal distance
(c) Perspective centre   (d) Camera axis
(e) Principal plane

ii. Define Hydrographic surveying. What are its uses? Also explain the term Sounding. **5**

iii. Explain active and passive remote sensing. Also write down the application of remote sensing. **5**

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Marking Scheme
CE3CO01 Engineering Surveying

Q.1 i. The operation of making the algebraic sum of latitudes and departures of a closed traverse, each equal to zero, is known   **1**
(d) Balancing the traverse

ii. Size of a theodolite is specified by   **1**
(c) The diameter of lower plate

iii. One of the tacheometric constants is additive, the other constant, is   **1**
(c) Multiplying constant

iv. The diaphragm of a stadia theodolite is fitted with two additional   **1**
(a) horizontal hairs

v. An ideal transition curve is   **1**
(b) Clothoid spiral

vi. For setting out a simple curve, using two theodolites.   **1**
(d) None of these

vii. For a well-conditioned triangle, no angle should be less than   **1**
(b) 30º

viii. The necessary geometrical condition for triangulation adjustment, is   **1**
(d) All of these

ix. The height displacement on a vertical photograph   **1**
(d) All of these

x. An aerial photograph may be assumed as   **1**
(c) Central projection

Q.2 i. Closing error in a traverse   1 mark   **4**
The bowditch's method   3 marks

ii.   **6**

Solution: Let l be the length and θ be the bearing of line AD. Then
$$\Sigma L = 0, \text{ gives}$$
$$485 \cos 342° + 1720 \cos 16° + 1050 \cos 140° + l \cos \theta = 0$$
$$\therefore \quad l \cos \theta = -1310.29 \quad\quad (i)$$ **1.5 marks**
$$\Sigma D = 0, \text{ gives}$$
$$485 \sin 342° + 1720 \sin 16° + 1050 \sin 140° + l \sin \theta = 0$$
$$\therefore \quad l \sin \theta = -999.15 \quad\quad (ii)$$ **1.5 marks**
Dividing eqn. (ii) by eqn. (i), we get
$$\tan \theta = 0.7625$$
$$\therefore \quad \theta = 37.33°,$$ **1 mark**
and it is in quadrant III since $l \sin \theta$ and $l \cos \theta$ both are −ve.
$$\therefore \quad \theta = 37.33 + 180 = 217.33°$$ **1 mark** Ans.
From eqn. (i), we get
$$l \cos 217.33° = -1310.29$$
$$\therefore \quad l = 1647.78 \text{ m}$$ **1 mark** Ans.

OR iii.   **6**

Solution:
$$RL \text{ of } BM = 400.0 \text{ m.}$$
$$S_1 = 1.830 \quad\quad S_2 = 3.150 \text{ m.}$$
$$\alpha_1 = 26° 36' \quad\quad \alpha_2 = 16° 48'$$

$$RL \text{ of target} = 400.0 + 1.830 + \frac{[(3.150 - 1.830) + 120 \tan 16° 48'] \tan 26° 36'}{(\tan 26° 36' - \tan 16° 48')}$$
$$= 400.0 + 1.830 + 94.565$$
$$= 496.395 \text{ m.}$$

But target is 3.8 m above the ground.
$$\therefore \quad RL \text{ of hilltop} = 469.395 - 3.800 = 492.595 \text{ m.}$$

Q.3 i. Advantages of tacheometric surveying   **2**
1 mark for each point   (1 mark * 2)

ii. Derivation   **8**
(a) Both angles are angle of elevation   4 marks
1 mark for each step (1 mark * 4)
(b) Both angles are angles of depression   4 marks
1 mark for each step (1 mark * 4)

OR iii. Anallactic lens expalanation   4 marks   **8**
Advantages of lens 1 mark for each (1 mark * 2)   2 marks
Disadvantages of lens 1 mark for each (1 mark * 2)   2 marks

Q.4 i. Relationship between the degree of a curve and its radius   **4**
By arc definition   2 marks
By chord definition   2 marks

ii. Each method of setting out a simple curve 0.5 marks   **6**
(0.5 mark * 6)   3 marks
The method of successive bisection of chords   3 marks

OR iii. Method of determining the length of a transition curve   **6**
3 marks for each method   (3 marks * 2)

Q.5 i. Each Classification of the triangulation 1 mark   **4**
(1 mark * 3) Maximum 3 marks   3 marks
The use of each system   1 mark

ii. Corrections to be applied to a measured base line and expression for their nature and magnitudes   **6**
1 mark to each   (1 mark * 6)

OR iii. Requirements of a site selected for a baseline in triangulation survey   **6**
1 mark to each point (1 mark * 4)   4 marks
Equipment are necessary to measure a base line accurately   2 marks

Q.6   Attempt any two:

i.   Define the following   **5**

     (a) Picture plane   1 mark

     (b) Principal distance   1 mark

     (c) Perspective centre   1 mark

     (d) Camera axis   1 mark

     (e) Principal plane   1 mark

ii.   Definition Hydrographic surveying   1 mark   **5**

     Its uses 0.5 mark for each (0.5 mark * 4)   2 marks

     Explanation of Sounding   2 marks

iii.   Explanation active remote sensing   2 marks   **5**

     Passive remote sensing   2 marks

     The application of remote sensing

     0.5 mark to each point (0.5 mark *2)   1 mark

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