Enrolment No./Seat No_____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE- SEMESTER–IV EXAMINATION – WINTER 2025**

**Subject Code:3140601 Date:13-11-2025**

**Subject Name:Surveying**

**Time:02:30 PM TO 05:00 PM Total Marks:70**

**Instructions:**

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1 (a) Explain in brief purposes of tacheometry. (3)

Q.1 (b) Explain with sketches temporary adjustment of theodolite. (4)

Q.1 (c) Enlist various methods of plane table survey and explain any one in detail. (7)

Q.2 (a) Explain in brief GPS. (3)

Q.2 (b) Explain in brief difference between Fixed hair method and Movable hair method. (4)

Q.2 (c) Two tangents intersect at a chainage of 1600 m the deflection angle being $34^0$. Calculate the following quantities for setting out a curve of radious 375 m. (7)
1. Tangent length 2. Length of long chord 3. Length of curve 4. Chainage of point of commencement and tangency 5. Apex Distance

**OR**

Q.2 (c) Explain in detail measurement of horizontal angle by repetition method using theodolite. (7)

Q.3 (a) Differentiate between plane surveying and geodetic surveying. (3)

Q.3 (b) Explain in brief instruments used in tacheometry. (4)

Q.3 (c) The following readings were taken with a tacheometer on a vertical shaft. Calculate the tacheometric constant. (7)

| Instrument Station | Staff Station | Horizontal Distance | Stadia Reading |
|---|---|---|---|
| A | P | 60 m | 1.25 1.50 1.75 |
| | Q | 110 m | 1.45 1.95 2.45 |

**OR**

Q.3 (a) Write advantages and disadvantages of plane table surveying. (3)

Q.3 (b) What is transition curve? Why and where it is provided? (4)

Q.3 (c) Explain in detail Gale's traverse table. (7)

Q.4 (a) Enlist various laws of weight. (3)

Q.4 (b) Explain in brief measurement of area by using planimeter. (4)

Q.4 (c) Enlist various methods of setting out simple circular curve and explain in detail one theodolite method of setting out a simple circular curve. (7)

**OR**

Q.4 (a) Discuss selection of triangulation station. (3)

Q.4 (b) Explain in brief vertical curves. (4)

Q.4 (c) The following offsets are taken from a survey line to a curved boundary line. (7)

| Distance(m) | 0 | 5 | 10 | 15 | 20 | 30 | 40 | 60 | 80 |
|---|---|---|---|---|---|---|---|---|---|
| Offset (m) | 3.40 | 2.60 | 3.90 | 4.30 | 5.90 | 4.40 | 3.70 | 3.30 | 1.90 |

Find the area between the survey line, the curved boundary line, and the first and last offsets by (I) The trapezoidal rule and (II) Simpson's rule

Q.5 (a) Explain in brief electromagnetic spectrum. (3)

Q.5 (b) Explain the following terms. (4)

1. Direct observations 2. Indirect observations 3. Most Probable value
4. Most probable error

Q.5 (c) An instrument was set up at A and the angle of elevation of the top of an electric pole BC was $36^0$ 42'. The horizontal distance between A and B , the foot of the pole was 402.60m. Determine the RL of the top of the pole C, if the staff reading held on a BM (RL 180 M) was 2.895 m with telescope in horizontal plane. (7)

**OR**

Q.5 (a) What is base line? How is it selected? (3)

Q.5 (b) Explain in brief various types of errors in surveying instruments. (4)

Q.5 (c) Explain in detail total station giving its uses and applications. (7)

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# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE- SEMESTER–IV (NEW) EXAMINATION – WINTER 2024**

**Subject Code:3140601 Date:19-11-2024**

**Subject Name: Surveying**

**Time:02:30 PM TO 05:00 PM Total Marks:70**

**Instructions:**

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

| | | | **MARKS** |
|---|---|---|---|
| **Q.1** | **(a)** | Explain any three instruments of plane table survey with sketch | **03** |
| | **(b)** | Discuss the various special functions of total station. | **04** |
| | **(c)** | Explain temporary adjustments of theodolite. | **07** |
| **Q.2** | **(a)** | State different methods of measurement of horizontal angle using theodolite and explain any one method | **03** |
| | **(b)** | Explain in brief method of setting out of circular curve by perpendicular offset from the long chord. | **04** |
| | **(c)** | An instrument was setup at P and the angle of elevation of the top of an electric pole QR was $25^0\ 30'$. The horizontal distance between P and Q, the foot of the pole was 500m. Determine the reduced level of the top of the pole, if the staff reading held on a B.M. (R.L. 100.00 m.) was 3.532m. with the telescope in horizontal plane. | **07** |
| | | **OR** | |
| | **(c)** | A traverse survey was conducted and the data obtained is given below in table. Find the magnitude and direction of the closing error if any. | **07** |

Traverse Data:

| Line | AB | BC | CD | DA |
|---|---|---|---|---|
| Length (in m.) | 156.4 | 178.3 | 234.9 | 202.5 |
| Bearing | $78^042'$ | $152^030'$ | $251^020'$ | $356^012'$ |

| | | | |
|---|---|---|---|
| **Q.3** | **(a)** | Define (1) Back Tangent (2) Point of Intersection (3) Angle of Deflection | **03** |
| | **(b)** | Differentiate between the trapezoidal rule and Simpson's rule. | **04** |
| | **(c)** | Enlist various methods of plane tabling. Explain any one in detail. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | Explain with figure The mid ordinate rule method of computation of Area. | **03** |
| | **(b)** | Discuss how reservoir capacity is determined. | **04** |
| | **(c)** | Explain the construction and working of the planimeter with a neat sketch. | **07** |
| **Q.4** | **(a)** | Write short note on Electronic Digital Theodolite. | **03** |
| | **(b)** | Differentiate between Fixed hair method and Movable hair method in Tacheometric surveying. | **04** |
| | **(c)** | What are the electromagnetic waves? Discuss their properties. | **07** |
| | | **OR** | |
| **Q.4** | **(a)** | Discuss in brief instruments used in tacheometry. | **03** |
| | **(b)** | Define true error, most probable error, residual error and normal equation. | **04** |
| | **(c)** | What is the weight of a quantity? Discuss various laws of weights. | **07** |

| | | | |
|---|---|---|---|
| **Q.5** | **(a)** | Write a note on Geospatial data | **03** |
| | **(b)** | What are the advantages and disadvantages of Plane Table Surveying? | **04** |
| | **(c)** | The following offsets were taken from a chain line to an irregular boundary line at an interval of 5m.<br>1.00,2.60,3.40,4.90,4.70,3.10,0.50m<br>Compute the area between the chain line, the irregular boundary line and the end offsets by (1) The mid ordinate rule (2) The average ordinate rule. | **07** |

**OR**

| | | | |
|---|---|---|---|
| **Q.5** | **(a)** | Define transition curve, compound curve and reverse curve. | **03** |
| | **(b)** | Define (1) Latitude (2) Departure (3 Independent Co-Ordinate (4) Consecutive Coordinate | **04** |
| | **(c)** | Explain the practical use and benefits of global positioning system (GPS) | **07** |

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# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER–IV (NEW) EXAMINATION – WINTER 2023**

**Subject Code:3140601 Date:11-01-2024**

**Subject Name: Surveying**

**Time: 10:30 AM TO 01:00 PM Total Marks:70**

**Instructions:**

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

| | | | |
|---|---|---|---|
| **Q.1** | **(a)** | List out various methods for the orientation of a plane table and explain any one with the figure. | **03** |
| | **(b)** | On which basic principle, EDM is working? For which type of special purposes the total station is used? | **04** |
| | **(c)** | Explain temporary adjustments of theodolite. | **07** |
| **Q.2** | **(a)** | Explain the basic principle of tacheometry. | **03** |
| | **(b)** | Explain the principle and uses of triangulation. | **04** |
| | **(c)** | Derive the expressions for determining horizontal distance and elevation in trigonometric leveling while the base of the object is inaccessible, and the instrument axes of both stations are at the same level in the same vertical plane. | **07** |
| | | **OR** | |
| | **(c)** | Define the terms: Face left, Transiting, Line of Collimation, Axis of the telescope, Axis of the plate level, Vertical axis, and Swinging the telescope. | **07** |
| **Q.3** | **(a)** | What are the advantages and disadvantages of plane table surveying? | **03** |
| | **(b)** | Enlist various methods of plane tabling and explain the radiation method with the figure. | **04** |
| | **(c)** | Explain the Global Positioning System (GPS) in detail. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | Why Trigonometric levelling is an indirect method of levelling? | **03** |
| | **(b)** | Calculate the least count of the vernier for the vernier transit theodolite. | **04** |
| | **(c)** | Explain various types of opaque and night signals with figures. | **07** |
| **Q.4** | **(a)** | Why is a curve provided on highways and railways? | **03** |
| | **(b)** | Differentiate between the Trapezoidal rule and Simpson's rule. | **04** |
| | **(c)** | How will you find the area of an irregular figure with the help of a planimeter? | **07** |
| | | **OR** | |
| **Q.4** | **(a)** | What is the transition curve? State the requirements of a transition curve. | **03** |
| | **(b)** | How will you allocate weights to the field observations? | **04** |
| | **(c)** | Derive the formula for the relation between the radius and degree of a curve by Arc definition and Chord definition. | **07** |
| **Q.5** | **(a)** | Write the equation to determine the probable error of a single measurement and Mean Square Error. | **03** |
| | **(b)** | Define the Angle of deflection, Normal chord, Tangent distance, and Point of curvature for a simple circular curve. | **04** |

| | | | |
|---|---|---|---|
| | **(c)** | Differentiate between the Fixed hair method and the Movable hair method. Also, differentiate between the Stadia hair method and the Tangential method. | **07** |

**OR**

| | | | |
|---|---|---|---|
| **Q.5** | **(a)** | Draw a figure of a simple circular curve with all its elements. | **03** |
| | **(b)** | What do you mean by Gross errors, Systematic errors, Accidental errors, and Residual errors? | **04** |
| | **(c)** | In tacheometric survey, derive the expression for horizontal and vertical distances in the fixed hair method when the staff is held vertically, and the measured angle is that of elevation. How will you find the RL of the staff station? | **07** |

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# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER–IV(NEW) EXAMINATION – WINTER 2022**

**Subject Code:3140601 Date:13-12-2022**

**Subject Name:Surveying**

**Time:10:30 AM TO 01:00 PM Total Marks:70**

**Instructions:**

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

**Q.1** **(a)** Explain principle of plane tabling. Explain orientation of a plane table by magnetic needle method. **03**

**(b)** Explain basic principle of EDM and working principle of GPS. **04**

**(c)** Which are the methods of theodolite traversing? Explain any one of them with figure. **07**

**Q.2** **(a)** Explain principle of tacheometry. **03**

**(b)** Explain the principle and uses of triangulation. **04**

**(c)** A theodolite traverse survey was conducted and the data obtained is given below. **07**

| Line | AB | BC | CD | DA |
|---|---|---|---|---|
| Length | 158.40 | 179.30 | 233.90 | 204.50 |
| Bearing | 78°42' | 152°30' | 251°20' | 356°12' |

Find the magnitude and direction of the closing error if any.

**OR**

**(c)** Derive the expressions for determining horizontal distance and elevation in trigonometric leveling while base of the object is inaccessible and the instrument axes of both stations are at the same level in same vertical plane. **07**

**Q.3** **(a)** An instrument was setup at D and the angle of elevation of the top of an electric pole PN was 31°20'. The horizontal distance between D and P, the foot of the pole was 378.80m. Determine the RL of top of the pole N, if the staff reading held on a BM (RL 180.00) was 3.145m. with telescope in horizontal plane. **03**

**(b)** Define the terms: Transiting, Line of collimation, Changing face and Swinging the telescope. **04**

**(c)** Two stations D and P, 82 km apart, have elevations 17 m and 270m above mean sea level respectively. Calculate the minimum height of the signal at P. **07**

**OR**

**Q.3** **(a)** In plane table survey at one plane table station it was found that the table was not accurately centered over the ground station. If the displacement was 40 cm in a direction at right angles to the ray. Calculate the displacement of the point from its true position on the plane table sheet if the scale of plotting is, (1) 1cm=50cm (2) 1:500 and (3) 1cm=50m. **03**

**(b)** Enlist various methods of plane tabling and explain traversing method with figure. **04**

**(c)** Explain electromagnetic spectrum also describe uses of total station in the field of civil engineering. **07**

**Q.4** **(a)** What is transition curve? State the requirements of a transition curve. **03**

**(b)** How will you allocate weights to the field observations? **04**

**(c)** Area enclosed between the dam and upstream contours at a reservoir site are as follows: **07**

| Contour level (m) | 54 | 56 | 58 | 60 | 62 |
|---|---|---|---|---|---|
| Enclosed area (sq.m) | 715 | 6515 | 52700 | 79000 | 374000 |

If the bottom level is 54 m and the F.R.L is 62 m, determine the capacity of the reservoir by trapezoidal and prismoidal formula. Also compute prismoidal correction.

**OR**

**Q.4** **(a)** Explain elements of a reverse curve with figure. **03**

**(b)** Derive an equation for calculating area by Mid-ordinate rule and Average-ordinate rule. **04**

**(c)** A compound curve, consisting of two simple circular curves of radii 350 m and 450 m, is to be laid out between two straights, The angles of intersection between the tangents and the two straights are 30° and 60°. Calculate the various elements of the compound curve. **07**

**Q.5** **(a)** Differentiate between direct observations and indirect observations. **03**

**(b)** Define point of curvature, length of the curve, sub-chord and right-hand curve. **04**

**(c)** In tacheometric survey, derive the expression for horizontal and vertical distances in the fixed hair method when the staff is held vertically and the measured angle is that of elevation. How will you find RL of staff station? **07**

**OR**

**Q.5** **(a)** Two straight intersect at chainage 3075.40m and the angle of intersection is 130°. If the radius of the simple curve to be introduced is 650m, find the tangent distances, chainage of the point of commencement and length of the long chord. **03**

**(b)** Define true error, most probable error, residual error and normal equation. **04**

**(c)** A tacheometer was setup on station A and the following readings were obtained on a staff vertically held. **07**

| Inst. Station | Staff Station | Vertical Angle | Hair Readings (m) | | |
|---|---|---|---|---|---|
| A | BM | -6°40' | 1.200 | 1.900 | 2.600 |
| | B | +8°20' | 0.800 | 1.600 | 2.400 |

Calculate the horizontal distance AB and RL of B. The constants of instrument are 100 and 0.15. RL of BM is 850.50m.

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