



- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Assume suitable data whenever necessary.
 10. Illustrate your answers whenever necessary with the help of neat sketches.
 11. Use of non programmable calculator is permitted.

1. a) Derive the equation $D=KS+C$ as used in fixed hair method of tacheometry. **6**
- b) A tacheometer was set up at a station 'A' and the reading on the vertically held staff at 'B' were 2.255, 2.605 and 2.955 the line of staff being at an inclination of $+8^{\circ}24'$, another observation on the vertically held staff at C gave the reading 1.640, 1.920 and 2.200 the inclination of line of sight being $+1^{\circ}06'$. Calculate horizontal distance between A and B and elevation of 'B' if the RL of 'C' is 418.685. The constant of instrument were 100 and 0.3. **7**

OR

2. a) Derive the distances and elevation formulae for line of sight inclined but staff normal to it, when the line of collimation is inclined upward. **5**
- b) To determine the distance between the two points 'C' and 'D'. The following observations were taken upon a vertically held staff from two transverse station A and B. The Tacheometer was fitted with an analectic lens, the constant of the instrument being 100. **8**

| Traverse Station | H.I. (m) | Co-ordinates (x, y) | Staff station | Bearing | Vertical Angle | Staff Reading |
|------------------|----------|---------------------|---------------|------------------|------------------|------------------------|
| A | 1.58 | 218.3, 164.7 | C | $330^{\circ}20'$ | $+12^{\circ}12'$ | 1.255, 1.860 2.465 |
| B | 1.50 | 518.2, 207.6 | D | $20^{\circ}36'$ | $+10^{\circ}36'$ | 1.300, 1.885, 2.470 |

Calculate :

- i) The distance CD
- ii) The reduced levels of C and D, given that those of A and B are 432.550 and 436.865m respectively.
- iii) Gradient from C to D.

3. a) Describe the method of setting out a simple curve by offset from the chords produced. **5**
- b) Two straights AB and BC intersect at an inaccessible point. A straight line MN intersect them making angle AMN = 115° and an angle CNM = 128°. The lengths of MN is 135.50M. The radius of the curve between the straights is 387.60 m and chainage of M is 1596.90 m. Compute the necessary data to set out the curve with 30 m chord length, with the help of theodolite. **8**

OR

4. a) A parabolic valley curve is to be set out connecting two uniform grade - 0.60% and +0.45% The chainage and reduced level of point of intersection are 10545.325 m and 192.235 m respectively. The rate of change of grade is 0.05% per chain of 20 m. Calculate the reduced levels of the various station pegs and tabulate in a table. **7**
- b) Two straights AB and CD intersect of V. BD is the common tangent of length 200 m. It is proposed to introduced a reverse curve between them the angles ABD and CDB are 150°30' and 43°12' respectively. Calculate : **6**
- i) The common radius
- ii) The chainages of PC, PRC and PT if that of B is 9245.80 m
5. a) Derive an ideal transition formulae. **5**
- b) A road bend which deflects 80° is to be designed for a maximum speed of 100 km per hour, a maximum centrifugal ratio of $\frac{1}{4}$ and maximum rate to the change of acceleration of 30 cm/sec³, the curve consisting of a circular arc combined with two cubic spiral. Calculate : **9**
- i) the radius of circular arc
- ii) the requisite length of transition curve
- iii) the total length of composite curve and
- iv) the chainage of the beginning and the end of the transition curve, and of the junctions of the transition curves with the circular arc if the chainage of the P.I. is 42862 m.

OR

6. a) Prove that the shift = $\frac{L^2}{24R}$ where, L is the length of curve and R is the radius of circular curve. **5**
- b) Two straights AB and BC intersect at chainage 1000 m, the deflection angle being 40°. It is proposed to insert a circular curve of radius 300 m with a transition curve of length 90m at each end. Calculate all the dates necessary for setting out the curve by the deflection angle method, taking peg interval of 20 m. Prepare the setting out table, taking the least count of theodolite 20". **9**
7. a) The altitude of two proposed stations A and B 130 km apart are respectively 220 m and 1240 m. The altitude of the two points C and D on a profile between them are respectively 305 m and 630 m. The distance AC = 60 km and AD = 100 km. Determine A and B are intervisible and if necessary find the minimum height of scaffolding at B assuming A as the ground station such that the new line of sight clear the peak by 3 m. **7**

- b) What is meant by satellite station and reduction to centre ? Derive expression for reducing the angles measured at the stations to centre. 7

OR

8. a) State and explain laws of weights. 6
- b) Determine the most probable values of the angles A, B and C from the following observed values. 8
- A = 42°36'28" weight 2
 B = 28°12'42" weight 2
 C = 65°25'16" weight 1
 A + B = 70°49'14" weight 2
 B + C = 93°37'55" weight 1

9. a) Derive the equation for relief displacement in a vertical photography with figure. 6
- b) An area 50 km x 36 km is to be photographed with a lens having 30 cm focal length for the purpose of constructing a mosaic. The photograph size is 20 x 20 cm. The average scale is to be 1:12000 effective at an elevation of 500 m above datum. Overlap is to be at least 60% and the side lap is to be at 30%. An intervalometer will be used to control the interval between exposures. The ground speed of the aircraft will be maintained at 200 km/hour. The flight lines are to be laid out in the long distance direction on existing map having a scale 1:60000. The two flight lines are to coincide with the short distance of the area Determine : 7
- i) flying height ii) theoretical ground spacing of flight lines
 iii) number of flight lines required iv) Spacing flight lines on flight map
 v) exposure interval vi) total number of photographs required.

OR

10. a) Derive parallel equation in determining the coordinates of points in aerial photogrammetry. 5
- b) Two points A and B have elevations of 400 m and 275 m respectively above datum appear on the vertical photograph having focal length of 20 cm and flying altitude 2000 m above datum. Their corrected photographic co-ordinates are as follows - 8

| Point | x (mm) | y (mm) |
|-------|--------|--------|
| a | +4.89 | +3.32 |
| b | -2.94 | -5.16 |

Determine the length of ground line AB.

11. a) Write a note on Napier rules of circular parts. 6
- b) Explain in brief about GPS and its applications. 7

OR

12. a) Explain the various co-ordinates system used in astronomy. 6
- b) What are the various applications of remote sensing. 7

Surveying - II

P. Pages : 3

Time : Three Hours



NJR/KS/18/4515

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Assume suitable data whenever necessary.
 10. Diagrams and chemical equations should be given whenever necessary.
 11. Illustrate your answers whenever necessary with the help of neat sketches.
 12. Use of non programmable calculator is permitted.

1. a) Explain the principle of Stadia tachometry. 6
- b) The following notes refers to a line which has been levelled tachometrically with a tachometer fitted with an analletic lens the multiple constant being 100. 8

| Inst. stn. | Height of axis | Staff stn | Vertical Angle | H air Reading | Remarks |
|------------|----------------|-----------|----------------|---------------------|---|
| P | 1.50 | B. M. | -6° 12' | 0.963, 1.515, 2.067 | R. L. of B. M. = 360.00 Staff being held vertically |
| P | 1.50 | Q | +7° 5' | 0.819, 1.341, 1.863 | |
| Q | 1.60 | R | +12° 27' | 1.860, 2.445, 3.030 | |

Compute the RLS of P, Q and R and horizontal distance PQ & QR.

OR

2. a) Derive the distance equation for the tangential system of tachometry when both the sighting are angle of depression. 6
- b) Following is the data relative to the observation made on vertically held staff with a tachometer fitted with an analletic lens. 8

| Inst. stn. | Ht. of axis | Staff stn | Vertical Angle | H air Reading |
|------------|-------------|-----------|----------------|---------------------|
| P | 1.5 | A | -5° 30' | 1.800, 2.210, 2.620 |
| P | 1.5 | B | +10° 30' | 1.800, 2.100, 2.400 |

Assuming the appropriate values of constant. Compute the reduced levels of A and B if the reduced level of P is 420.00 m.

3. a) Derive the eqn of setting out circular curve by offset from chord produced method. 6

- b) Two straights intersect at chainage (47 + 12), the deflection angle being 40°. Calculate all the data necessary for setting out a 6° curve by the method of offsets from chord, the peg interval being 30 m. **8**

OR

4. a) Define vertical curve with neat sketches classify vertical curve and explain how to find out length of vertical curve. **6**

- b) A reverse curve is to be run from a point T₁ on AA' to the point T₂ on CC'. Determine the common radius and the length of the two parts of the curve, given that T₁T₂ is 720 m and the angles A T₁T₂ and T₁T₂C' are 47° 30' and 25° 12' respectively. **8**

5. a) Prove that the shift = $\frac{L^2}{24R}$ where L is the length of transition curves and R is the radius of circular curve. **6**

- b) Two straights AB and BC intersect at chainage 1000 m, the deflection angle being 40°. It is proposed to insert a circular curve of radius 300 m with a transition curve of length 90 m. at each end. Calculate all the data necessary for setting out the curve by the deflection angle method, taking peg interval of 20 m. Prepare the setting out table, taking the least count of theodolite as 20". **7**

OR

6. a) Explain the different methods for finding out the length of transition curve. **6**

- b) Two straights AB and BC intersect at chainage (412 - 15), the deflection angle being 40°. It is proposed to insert a circular curve of 300 m radius with a transition curve 90 m. long at each end. Make all the calculations necessary for setting out the curve by method of deflection angle using peg interval as 15 m on transition curve and 30 m on the circular curve. **7**

7. a) Enlist and describe in brief the various corrections to be applied to the base line measurement with formulae. **5**

- b) The altitude of two proposed station A and B 110 km apart are respectively 420 m and 700 m. The interlining obstruction situated at C, 70 km from 'A' has an elevation of 478 m. Ascertain if A and B are intervisible and if necessary find by how much 'B' should be raised so that the line of sight must nowhere be less than 3 m about the surface of the ground. **8**

OR

8. a) State and explain the laws of weight. **5**

- b) Determine the most probable values of the angles. A, B and C from following observed values. **8**

$$A = 42^\circ 36' 28'' \quad \text{wt } 2$$

$$B = 28^\circ 12' 42'' \quad \text{wt } 2$$

$$C = 65^\circ 25' 16'' \quad \text{wt } 1$$

$$A + B = 70^\circ 49' 14'' \quad \text{wt } 2$$

$$B + C = 93^\circ 37' 55'' \quad \text{wt } 1$$

9. a) Derive the equation for relief displacement in a vertical photography with figure. 6
- b) Two points A and B have elevation of 400 m and 275 m respectively above datum appear on the vertical photograph having focal length of 20 cm and flying altitude 2000 m. above datum. Their corrected photographic Co - ordinates are as follows. 7

| Point | X (mm) | Y (mm) |
|-------|--------|--------|
| a | + 4.89 | + 3.32 |
| b | - 2.94 | - 5.16 |

Determine the length of the ground line AB.

OR

10. a) Derive an expression to calculate focal length of a phototheodolite. 6
- b) Determine the number of photographs required to cover an area 20km×15km if the longitudinal lap is 65% and side lap is 30%. The photograph size is 20cm×20cm the scale of photograph is 1 : 15000. 7
11. a) Explain GIS and its components. 7
- b) Explain Napier's rules of circular parts. 6

OR

12. a) Explain various co-ordinate systems used in astronomy. 7
- b) What are the various applications of Remote Sensing. 6



- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Assume suitable data whenever necessary.
 9. Illustrate your answers whenever necessary with the help of neat sketches.
 10. Use of non programmable calculator is permitted.

1. a) What is the principle of Tacheometry? Describe method of determining the constants of Tacheometer from field measurement. **6**
- b) A tacheometer is setup at an intermediate point a traverse course PQ and following observations are made by vertically held staff. **7**

| Staff Stn | Vertical Angle | Staff intercept | Axial hair Reading |
|-----------|----------------|-----------------|--------------------|
| P | +9°30' | 2.250 m | 2.105 m |
| Q | +6°00' | 2.055 m | 1.875 m |

The instrument is fitted with an analytic lens and the multiplying constant is 100. Compute the length PQ and reduced level of Q. RL of P is 350.50 m.

OR

2. a) Derive the expression for horizontal and vertical distances by the tangential method when both angles measured are those depression. **5**
- b) In a Tacheometric survey made with staff normal to the line of sight and the constants are 100 and 1.0 Two sets of reading to staff station A and B are as follows. **8**

| Inst. Stn. | Height of Instrument | Staff Stn. | Azimuth | Vertical Angle | Staff Reading |
|------------|----------------------|------------|---------|----------------|-------------------|
| P | 1.80 m | A | 45° | +6° 0' | 1.0, 1.850, 2.500 |
| P | 1.80 m | B | 130° | +6° 30' | 1.0, 1.900, 3.100 |

If the reduced level P is 325.50 m. Calculate.

- i) The horizontal distance AB,
- ii) Gradient between A & B.
- iii) Reduced Level of A & B.

3. a) Define vertical curve. What are its various types? Derive the expression for its Various elements. 7
- b) A Reverse curve is to be set out between two parallel tangents 30 m apart. The line Joining the two tangent points is 300 m. apart. The two arc of the curve have same radius. Calculate the necessary data to set the curve of the field by offset from Long chord at the interval of 20 m. from common tangent point. 7

OR

- 4 a) Define tangential angle and deflection angle. Derive the equation $S = \frac{1718.9C}{R}$ where S, C and R arc tangential angle. chord length and radius of circular curve respectively. 6
- b) A parabolic vertical curve is to be set out connecting two uniform level grades of + 0.8% and – 0.9%. The chainage and reduced level of point of intersection are 1664 meter and 238.55 meter respectively. The rate of change of grade is 0.05% per chain of 20 m. Calculate the reduced levels of the various station pegs. 8
5. a) A composite curve is to be set out with the following data. Deflection angle = 60° 8
 maximum speed of vehicle = 80 km/hr
 centrifugal ratio = 1/8, Rate of change of radial acceleration = 0.3 m/sec³
 chainage of intersection point = 1150 m.
 Calculate
 1) Radius of circular curve.
 2) Length of transition curve.
 3) Chainage of tangent point and junction of transition curve with circular curve.
 4) Total Length of the composite curve.
- b) Derive an expression for shift of transition curve. 5

OR

6. a) State the different methods of calculating the length of transition curve. 5
- b) Two straights AB and BC intersect at chainage 1530.685 m. the total deflection angle 33°08'. It is proposed to insert a circular curve of 1000 m. radius and transition curve for a rate of change of radial acceleration of 0.3 m/s³ and velocity of 108 km/hr. Determine setting out data using theodolite and tape for the transition curve at 15 m interval and the circular curve at 30 m interval. 8
7. a) What is phase correction? Derive the expression to find the phase correction when line of sight is towards the bright portion of signal? 7
- b) The following are mean values observed in the measurement of three angles. 7
 α, β & γ at one station.
 $\alpha = 76^\circ 42' 46.2''$ with weight 4
 $\alpha + \beta = 134^\circ 36' 32.6''$ with weight 3
 $\beta + \gamma = 185^\circ 35' 24.8''$ with weight 3
 $\alpha + \beta + \gamma = 262^\circ 18' 10.4''$ with weight 1
 Calculate the most probable value of each angle.

OR

8. a) The altitude of two proposed station A and B 130 km apart are respectively 220 m and 1160 m. The altitude of the two point C and D on a profile between them are respectively 308 m and 632 m. The distance AC = 50 km and AD = 90 km. Determine wheather A and B are intervisible and if necessary find the minimum height of scaffolding at B. Assuming A as the ground station such that new line of sight clears the peak by 3 m . **8**
- b) Enlist and describe brief the various corrections to be applied to the baseline measurement with formulae. **6**
9. a) Derive the expression for relief displacement in vertical photogrammetry with figure. **6**
- b) The scale of an aerial photograph is 1 cm = 100 m. The photograph size 20 cm x 20 cm. Determine the number of photographs required to cover an area of 100 sq. km. If the longitudinal lap is 60 % and side lap is 30 % . **7**

OR

10. a) Obtain an expression for the number of photograph required for a given area of length and width for such a survey. **5**
- b) Two points A and B having elevation of 650 m. and 350 m. respectively above datum appear on the vertical photograph having focal length of 20 and flying altitude of 2500 m. above datum. Their corrected photographic Co-ordinates are as follows. Determine the length of the ground line AB. **8**

| Point | Photograph x cm | Co-ordinates Y cm |
|-------|-----------------|-------------------|
| A | +2.65 | +1.36 |
| B | -1.92 | +3.65 |

11. a) Explain in brief about GIS and its application. **7**
- b) Write a note on Napier's rules of circular parts. **6**

OR

12. a) Explain the process of energy interaction in the atmosphere in remote sensing. **7**
- b) Explain the various Co-ordinate systems used in astronomy. **6**



- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Assume suitable data whenever necessary.
 10. Illustrate your answers whenever necessary with the help of neat sketches.
 11. Use of non programmable calculator is permitted.

1. a) Derive an expression for the horizontal distance of a vertical staff from a tacheometer if the line of sight of the telescope is horizontal. 5
- b) A tacheometer is setup at an intermediate point on a traverse course PQ and the following observation are made on a vertically held staff. 8

| Staff station | Vertical angle | Staff intercept | Axial hair reading |
|---------------|----------------|-----------------|--------------------|
| P | +9°30' | 2.250 m | 2.105 m |
| Q | +6°00' | 2.055 m | 1.875 m |

The instrument is fitted with an anallactic lens and the multiplying constant is 100. Compute the length PQ and the reduced level of Q. RL of P = 350.50 m.

OR

2. a) Differentiate between the fixed hair method and movable hair method. Give advantages and disadvantages of each method. 5
- b) The following is the data relative to the observations made on a vertically held staff with a tacheometer fitted with an anallactic lens. 8

| Inst. stn | Ht. of axis | Staff stn. | Vertical angle | Hair Readings |
|-----------|-------------|------------|----------------|---------------------|
| P | 1.5 | A | -5°30' | 1.800, 2.210, 2.620 |
| P | 1.5 | B | +10°30' | 1.800, 2.100, 2.400 |

Assuming the appropriate values of constant, compute the reduced levels of A and B if the reduced level of P is 420.000 m.

3. a) Derive the formulae for chainage of T_1 , T_2 and T_3 for a compound curve. Where T_2 is the common tangent. Also find formulae for chord length, tangent length of shortest and longest side. 5
- b) Two straights AB and BC meet in an inaccessible point B and are to be connected by a simple circular curve of 600 m radius. Two points P and Q were selected on AB and BC respectively, and the following details were obtained. Angle APQ = 150° , angle CQP = 160° and PQ = 150 m. Make the calculations to set out the curve by Rankine's method of deflection angles. The chainage of P is 1600 m. Assume a unit chord of 30 m. 9

OR

4. a) Define vertical curve with neat sketches classify vertical curve and explain how to find out length of vertical curve. 6
- b) A reverse curve is to be run from a point T_1 on AA' to the point T_2 on CC'. Determine the common radius and the length of the two parts of the curve, given that $T_1 T_2$ is 720 m and the angles $AT_1 T_2$ and $T_1 T_2 C'$ are $47^\circ 30'$ and $25^\circ 12'$ respectively. 8
5. a) Prove that the shift = $L^2/24R$ where, L is the length of transition curves and R is the radius of circular curve. 5
- b) Two straights AB and BC intersect at chainage 1000 m, the deflection angle being 40° . It is proposed to insert a circular curve of radius 300 m with a transition curve of length 90 m at each end. Calculate all the data necessary for setting out the curve by the deflection angle method, taking peg interval of 20 m. Prepare the setting out table, taking the least count of theodolite as $20''$. 8

OR

6. a) Explain the characteristics of transition curve. 4
- b) Two straights having a total deflection angle of $65^\circ 45'$ are connected with a circular curve of radius 1550 m. It is required to introduce a curve of length 120 m at the beginning and end of the circular curve without altering the total length of the route. The transition curve to be inserted is a cubic spiral, and the chainage of the point of intersection is 5302.10 m. Calculate : 9
- i) The distance between the new and the previous tangent point.
 - ii) The setting out data for transition curve taking peg intervals 20 m and
 - iii) The data for locating the midpoint of the new circular curve from the point of intersection.
7. a) State and explain laws of weights. 4
- b) The altitude of two proposed station A and B 130 km apart are respectively 220 m and 1160m. The altitude of the two points C and D on a profile between them are respectively 308m and 630 m. The distance AC = 50 km and AD = 90 km. Determine whether A and B are intervisible and if necessary find the minimum height of a scaffolding at B assuming A as the ground station such that new line of sight clears the peak by 3 m. 9

OR

8. a) Explain the factors affecting the height of the instrument as well as signals for intervisibility in geodetic survey. **5**
- b) Given the following observations at a station O. **8**
 AOB (A) = $87^{\circ} 34' 22''$ weight 2
 BOC (B) = $98^{\circ} 42' 18''$ weight 3
 COD (C) = $102^{\circ} 26' 9''$ weight 4
 DOA (D) = $71^{\circ} 17' 4''$ weight 1
 Find the most probable value of A, B, C and D. Here the condition is that $A + B + C + D = 360^{\circ}$ since the horizon is closed.

9. a) Derive the equation for relief displacement in a vertical photography with sketch. **7**
- b) The scale of the photograph is $1\text{cm} = 100\text{m}$. The photograph size is $23\text{cm} \times 23\text{cm}$. Determine the number of photographs required to cover an area of 150sq. km . If the longitudinal overlap is 60% and side overlap is 30%. **7**

OR

10. a) What is the principle of the method of terrestrial photogrammetry? Explain the principle by graphical or analytical method. **7**
- b) Two points A and B have elevations of 400 m and 275 m respectively above datum appear on the vertical photograph having focal length of 20 cm. and flying altitude 2000 m above datum. Their corrected photographic co-ordinates are as follows **7**

| Point | x (mm) | y (mm) |
|-------|--------|--------|
| a | + 4.89 | + 3.32 |
| b | - 2.94 | - 5.16 |

Determine the length of the ground line AB.

11. a) Explain Napier's rules of circular parts. **6**
- b) Write a short note on electronic distances measurements (EDM). **7**

OR

12. a) What is Raster model and write its advantages and disadvantages. **7**
- b) Define GIS and Explain its components and advantages. **6**



- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Assume suitable data whenever necessary.
 10. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) What is the principle of Tacheometry? Derive the formula for the distance, when the line of sight is horizontal and the staff is vertical? **6**
- b) The following observation were made using a tachometer fitted with an anallactic lens, the multiplying constant being 100 Calculate the distance AB, and RLs of A and B. find also the gradient of the line AB **7**

| Inst. Station | Height of Inst | Staff Station | W.C.B | Vertical angle | Hair Reading | Remarks |
|---------------|----------------|---------------|--------|----------------|---------------------------|-------------------------|
| 0 | 1,550 | A | 30°30' | 4°30' | 1.155, 1.755, 2.350 | R.L of O = 150.00 |
| | | B | 75°30' | 10°15' | 1.250, 2.000, 2.750 | |

OR

2. a) Differentiate between the fixed hair method and movable hair method. Give advantages and disadvantages of each method. **6**
- b) Describe the method of a tachometer from field measurement, **7**
3. a) What are the different types of curves? Draw neat sketches of each. Explain all the types in brief. **7**
- b) Derive the equation in finding the offset from the chords produced. **7**

$$O_n = \frac{C_n (C_n + C_{n-1})}{2R}$$

OR

4. a) Two tangents AB and BC intersect at B, Another line DE intersects AB and BC at D and E such that angle ADE = 150° and angle DEC = 140° The radius of 1st curve is 200 m and that of second curve is 300 m. The chainage of B is 950m. Calculate all data be necessary for setting out compound curves. **7**

- b) Define tangential angle and deflection angle. Derive the equation $\delta \frac{1718.9C}{R} = \text{minutes}$ where $\delta, c,$ and R one tangential angle chord length and radius of curve. 7

5. a) Two straights AB and BC intersect at chainage 1024.50 m The angle of intersection is 110° . It is required to setout a simple circular curve of 224 m radius to connect two straights. Calculate all the data necessary to set out the Curve by the Rankine method with peg interval of 20 m and 20 "theodolite. 6
- b) State an expression for calculating the length of a vertical. 7

OR

6. a) Show, with the neat sketches, the different types of vertical curves possible. 6
- b) Along the alignment of a road it is found in a particular portion that a grade of $+0.5\%$ is followed by one of -0.7% . The two ends of this portion are 550.00 and 375.50 m respectively. Calculate the RLS of the points on the curve, taking a peg interval of the points on the curve, taking a peg interval of 20m. Tabulate result. The rate of change of grade is 0.1% per 20m. 7
7. a) Methods in finding the length of transition curve. 6
- b) What is purpose of triangulation? With the aid of suitable sketch, explain the figures generally adopted in triangulation network. 7

OR

8. a) Enlist and describe in brief the various corrections to be applied to the base line measurement with the formulae. 6
- b) Describe in brief the classification of triangulation system. 7
9. a) Find the most probable values of the angles A, B, C from the following observation at a Station P:- 7

| | | |
|-------|------------------------|----------|
| A | $= 38^\circ 25' 20''$ | Weight 1 |
| B | $= 32^\circ 36' 12''$ | Weight 1 |
| A+B | $= 71^\circ 01' 29''$ | Weight 2 |
| A+B+C | $= 119^\circ 10' 43''$ | Weight 1 |
| B+C | $= 80^\circ 45' 28''$ | Weight 2 |

- b) Write differences between terrestrial and aerial photogrammetry. 6

OR

10. a) What is Remote Sensing Explain the fundamental concept of Remote Sensing? 6
- b) What do you understand by GIS Describe various components of GIS. 7

11. a) Two point A and B having elevation of 500m and 300m respectively above datum appear on the vertical photograph having focal length of 20cm and flying altitude of 2500m above datum. Their corrected photographic co-ordinates are as follows; 7

| Point | Photographic X(cm) | Coordinates X(cm) |
|-------|--------------------|-------------------|
| a | +2.65 | +1.36 |
| b | -1.92 | +3.65 |

Determine the length of the ground line AB.

- b) The scale of an aerial photograph is 1 cm = 160 m and the size of the photograph is 20 cm x 20 cm. If the longitudinal lap is 65% and side lap is 35% determine the number of photograph required to cover an area of 232 sq. km. 7

OR

12. Write a short notes **any three**. 14

- 1) Law of weight
- 2) Stereoscope
- 3) Auto reduction tacheometer.
- 4) Points to be kept in mind in selection of triangulation stations.
- 5) Ideal transition curve
