



Un punto situado a 476,528 m antes del vértice V2 tiene una progresiva de 3+275,264.

Sabiendo que el radio de curvatura de la curva vale 320 m, determinar:

- 1.- L_c , T , E , M , C_c , C_l .
- 2.- Progresivas de los puntos principales de la curva.
- 3.- Coordenadas norte y este de TC, CC, CT y O.
- 4.- Coordenadas polares del punto de progresiva 3+800-
- 5.- Coordenadas rectangulares del punto de progresiva 3+800.
- 6.- Coordenadas norte y este del punto de progresiva 3+800.

RESOLUCION:

$$\Delta = AZ_{V_2}^{V_3} - AZ_{V_1}^{V_2}$$

$$AZ_{V2}^{V3} = \frac{E_3 - E_2}{N_3 - E_2} = \frac{6.600,681 - 6.000}{5.155,179 - 5.000} = 75^\circ 30' 54''$$

$$AZ_{V2}^{V3} = \frac{E_2 - E_1}{N_2 - E_1} = \frac{6.000 - 5617,479}{5.000 - 4.584,194} = 42^\circ 36' 45''$$

$$\Delta = 75^\circ 30' 54'' - 42^\circ 36' 45'' = 32^\circ 45' 09''$$

$$L_C = \frac{\pi \times R_C \times \Delta}{180^\circ} = \frac{\pi \times 320 \times 32,9025}{180^\circ} = 183,762 \text{ m.}$$

$$T = R_C \times \tan \frac{\Delta}{2} = 320 \times \tan \left(\frac{32^\circ 54' 09''}{2} \right) = 94,492 \text{ m.}$$

$$E = R_C \left(\sec \frac{\Delta}{2} - 1 \right) = 13,660 \text{ m.}$$

$$M = R_C (1 - \cos \frac{\Delta}{2}) = 13,100 \text{ m.}$$

$$\text{Cuerda Corta } C_C = 2 \times R_C \times \sin \frac{\Delta}{4} = 91,566 \text{ m.}$$

$$\text{Cuerda Larga } C_L = 2 \times R_C \times \sin \frac{\Delta}{2} = 181,248 \text{ m.}$$

$$\alpha = 180^\circ - \Delta$$

$$\text{Progresiva TC} = 3+275,264 + 476,528 - 94,492 = 3+657,300$$

$$\text{Progresiva CC} = 3+657,300 + 91,881 = 3+749,181$$

$$\text{Progresiva CT} = 3+749,181 + 91,881 = 3+841,062$$

Coordenadas del TC

$$N_{TC} = N_{V2} + T \times \cos AZ_{V2}^{TC}$$

$$E_{TC} = E_{V2} + T \times \sin AZ_{V2}^{TC}$$

$$AZ_{V2}^{TC} = AZ_{V1}^{V2} + 180^\circ = 42^\circ 36' 45'' + 180^\circ = 222^\circ 36' 45''$$

$$N_{CC} = 5.000 + 94,496 \times \cos(222^\circ 36' 45'') = 4.930,459$$

$$E_{CC} = 6.000 + 94,496 \times \sin(222^\circ 36' 45'') = 5.936,025$$

Coordenadas del CC

$$N_{CT} = N_{V2} + T \times \text{Cos}AZ_{V2}^{CT}$$

$$E_{CT} = E_{V2} + T \times \text{Sen}AZ_{V2}^{CT}$$

$$AZ_{V2}^{CC} = AZ_{V2}^{V3} + \frac{\alpha}{2} = 75^\circ 30' 54'' + \frac{147^\circ 05' 51''}{2} = 149^\circ 03' 49,5''$$

$$N_{CC} = 5.000 + 13,660 \times \text{Cos}(149^\circ 03' 49,5'') = 5.023,635$$

$$E_{CC} = 6.000 + 13,660 \times \text{Sen}(149^\circ 03' 49,5'') = 6.007,022$$

Coordenadas del CT

$$N_{CT} = N_{V2} + T \times \text{Cos}AZ_{V2}^{CT}$$

$$E_{CT} = E_{V2} + T \times \text{Sen}AZ_{V2}^{CT}$$

$$AZ_{V2}^{CT} = AZ_{V2}^{V3} = 75^\circ 30' 54''$$

$$N_{CT} = 5.000 + 94,49 \times \text{Cos}(75^\circ 30' 54'') = 5.023,635$$

$$E_{CT} = 65.000 + 94,49 \times \text{Sen}(75^\circ 30' 54'') = 6.091,488$$

Coordenadas de O

$$\text{Distancia}_{V2}^O = E + R_C = 13,660 + 320 = 333,660 \text{ m.}$$

$$N_O = 5000 + 333,660 \times \text{Cos}(149^\circ 03' 49,5'') = 4.713,807$$

$$E_O = 6000 + 333,660 \times \text{Sen}(149^\circ 03' 49,5'') = 6.171,529$$

Coordenadas polares del punto de progresiva 3+800

$$L = \text{Progresiva } 3+800 - \text{progresiva TC} = 3+800 - 3+657,300 = 142,700 \text{ m.}$$

$$\theta = \frac{L \times 180^\circ}{R_C \times \pi} = \frac{142,700 \times 180^\circ}{320 \times \pi} = 25^\circ 33' 01''$$

$$\phi = \frac{\theta}{2} = 12^\circ 46' 31''$$

$$C = 2 \times R_C \times \text{Sen} \frac{\theta}{2}$$

Coordenadas cartesianas del punto de progresiva 3+800

$$X = R_C \times \text{Sen} \theta = 320 \times \text{Sen}(25^\circ 33' 01'') = 138,017 \text{ m.}$$

$$Y = R_C \times (1 - \text{Cos}\theta) = 320 \times (1 - \text{Cos}(25^\circ 33' 01'')) = 31,294 \text{ m.}$$

Coordenadas N, E del punto de progresiva 3+800

$$N_{TC} = 4.930,459 \quad E_{TC} = 5.936,025$$

$$\text{Distancia}_{TC}^{3+800} = C = 141,521 \text{ m}$$

$$AZ_{TC}^{3+800} = AZ_{TC}^{V2} + \phi = 42^\circ 36' 45'' + 12^\circ 46' 31''$$

$$AZ_{TC}^{3+800} = 55^\circ 23' 16''$$

$$N_{3+8000} = N_{TC} + D \times \text{Cos}AZ_{TC}^{3+800} = 5.010,846$$

$$E_{3+8000} = E_{TC} + D \times \text{Sen}AZ_{TC}^{3+800} = 6.052,499$$