

Menoufia University
Faculty of Engineering, Shebin El-Kom
Civil Engineering Department
Second Semester Exam, 2016-2017
Date of Exam: 29 / 5 / 2017



Subject : Geometric Geodetic Surveying
Code: CVE535
Year : Diploma level course, Public Works
Time: Three hours
Total: 100 marks

Answer all Questions (Use complete equations & clear sketches) [Marks]

Question (1) [30]

a) Compute the mean radius of curvature along the line AB , given that:

$$\varphi_A = 25^\circ 13' 28'' N \quad , \quad \varphi_B = 25^\circ 40' 59'' N ,$$

$$\alpha_{AB} = 10^\circ 18' 26'' \quad , \quad \alpha_{BA} = 190^\circ 40' 39'' \quad , \quad a = 6378137.004 \text{ m} \quad , \quad \frac{1}{f} = 298.2573$$

b) Given that the Earth's radius is 6359.109 km . Using two methods, compute the spheroidal excess of the triangle ABC , if : $AB = 27.116 \text{ km}$, $AC = 31.428 \text{ km}$, $BC = 33.006 \text{ km}$

Question (2) [25]

a) If the difference in longitude between D & E is $19' 15''$, determine the convergence of meridians of the two points, given that:

$$\varphi_D = 23^\circ 10' 41'' N \quad , \quad \varphi_E = 23^\circ 24' 17'' N$$

b) Calculate the mean radius of curvature at point C , if $\varphi_C = 29^\circ 17' 19'' N$ and:

$$a = 6378136.231 \text{ m} \quad , \quad \frac{1}{f} = 297.8892$$

Then, compute the mean radius of curvature at a point on the Equator.

Question (3) [15]

- Discuss the difference between the 2D angular and mapping coordinates,
- Compare between the 3D Cartesian and curvilinear coordinates,
- Expalin the possible transformation parameters between any two 3D Cartesian systems.

Question (4) [15]

- Define the local geodetic, geodetic and geocentric coordinate systems,
- Discuss both the 2D- and 3D approaches in geodetic position computations. Mention the advantages of the 3D approach,
- Explain the 2D inverse geodetic problem.

Question (5) [15]

- Show the relation between the 3D-curvilinear coordinates of a given point and the corresponding Cartesian coordinates,
- Discuss the coordinate transformation from the local geodetic system to the geocentric coordinate system.

Best Wishes