|  |  |  |
| --- | --- | --- |
| Benha University |  | Second Year Surveying |
| Faculty of Engineering at Shoubra | Final Exam |
| Surveying Engineering Department | Statistics &Theory of Errors |
| Academic Year: 2017/2018 | Course Code: SUR214  |
| Semester: First | Date: 04 – 01 – 2018 |

|  |  |
| --- | --- |
| * Answer all the following questions
 | * Duration: **3** Hours (for the two pages)
 |
| * Illustrate your answers with sketches when necessary
 | * No of questions in the first page: **3**
 |
| * Assume any missing data
 | * Total Marks: **80** Marks (for the two pages)
 |

الورقة الأولى

**Q1.** List all the possible systematic, random errors and mistakes when measuring:

(a) A distance with a tape. (b) A distance with an EDM.

(c) An angle with a total station. (d) The difference in elevation using a level instrument. (10 marks)

**Q2.** The following 15 data values represent the seconds’ portion of the directions to a triangulation station:

42.1, 38.4, 39.8, 37.9, 40.3, 42.6, 42.7, 40.8, 42.1, 40.9, 41.8, 39.6, 41.7, 41.2, and 40.3.

1. Calculate the mode and the median of these data. (2 marks)
2. Calculate the standard deviation and the standard deviation of the data mean. (3 marks)
3. Determine the peak value and the points of inflection for the normal distribution curve representing the data. (3 marks)
4. Calculate the *E*50, *E*90 and *E*95 interval, and its corresponding actual percentage of the data. (4 marks)
5. Can any observations be rejected as blunders at a 99.7% level of certainty? (3 marks)

**Q3.**

1. From the pre-analysis of a horizontal control network, it is known that all angles must be measured to within ±2” at the 95% confidence level. How many repetitions are needed if the standard deviation for a single angle measurement is determined to be ±3.2”? (5 marks)
2. The calibrated length of a baseline is 141.167 m. An average distance of 141.205 m with a standard deviation of ± 0.005 m is computed after it is observed 16 times with an EDM. Determine the 95% confidence interval for the population mean, (1.5 marks)

At a 95% and 99.7% level of confidence, can you state that the EDM is working properly? Justify your response statistically. (3.5 marks)

|  |  |  |
| --- | --- | --- |
|  Best Wishes  |  |  Board of Examiners  |

1. The owner of a surveying firm wants all surveying technicians to be able to read a particular instrument to within ±2". To test this value, the owner asks the senior field crew chief to perform a reading test with the instrument. The crew chief reads the circle 16 times and obtains 𝞼r = ±1.2". Does this support the 2" limit at a 5% level of significance? (Tabulated Value: 25) (5 marks)