



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF THE BUILT ENVIRONMENT

DEPARTMENT OF QUANTITY SURVEYING

ENGINEERING SURVEYING

AQS 1208

Supplementary Examination Paper

July 2015

This examination paper consists of 5 pages

Time Allowed: 3 hours

Total Marks: 100

Examiner's Name: Mr A. Shanji

INSTRUCTIONS

1. Answer any four (4) questions
2. Each question carries 25 marks

MARK ALLOCATION

| QUESTION | MARKS |
|-----------------|--------------|
| 1. | 25 |
| 2. | 25 |
| 3. | 25 |
| 4. | 25 |
| 5. | 25 |
| | |

QUESTION ONE

- a) Briefly explain the methods of taping used in Surveying [4]
- b) Explain what is meant by the term taping and briefly discuss why steel tapes are standardised. [6]
- c) Calculate the Mean Sea Level distance of the line AB measured with a 100m steel tape using the following data.

| Line | Distance Measured | Field Temperature °C | Field Tension (N) | Slope Angle (d.m.s) | Bays |
|------|-------------------|----------------------|-------------------|-------------------------|------|
| AB | 99.978 | 29 ⁰ C | 85N | 2 ⁰ 45' 00'' | 3 |

Tape data

| | |
|---------------------------------|--|
| Standard temperature | 20 ⁰ C |
| Standard Tension | 70N |
| Mass of tape per unit length | 0.012kg/m |
| Young's modulus of elasticity | 2.11 x 10 ⁶ kg/m ² |
| Coefficient of linear expansion | 1.7 x 10 ⁻⁵ /°C |
| Cross sectional area of tape | 7mm ² |
| Mean height of line AB | 1900m |
| Mean Radius of Earth | 6361.1km |
| 1kgF | 9.81N |

QUESTION TWO

- a) With the aid of neatly sketched diagrams, explain how you would check a level for adjustment using the classical **two peg test**. [10]
- b) The following consecutive readings were taken with a level on a continuously sloping ground at a common interval of 20m. The last station has an elevation of 155.272m. Rule out a level book page and enter the readings.
0.420; 1.115; 2.265; 2.900; (3.615; 0.535); 1.470; 2.815; 3.505; (4.445; 0.605); 1.925 and 2.885

Calculate:

- i) The reduced level of the points by the Rise and Fall Method [10]
- ii) The gradient of the line joining the first and the last points. [5]

QUESTION THREE

a) A stockpile of 11690 tonnes of quarry is to be established on a level surface by end tipping from a conveyor belt situated 20m vertically above forming a stockpile of regular cone with an angle of repose of 37° . Calculate the height of the conical stockpile accepting that 1m^3 of broken ore is 1.67 tonnes. [15]

b) A tract of land has three straight boundaries AB; BC; and CD. The fourth diagram boundary DA is irregular. The measured lengths are: AB = 135m; BC = 191m; CD = 126m and BD = 255m.

The offsets were measured outside the boundary DA to the irregular boundary at a regular interval of 30m from d, are as below.

| | | | | | | | |
|------------|-----|-----|-----|-----|-----|-----|-----|
| Distance | 0.0 | 30 | 60 | 90 | 120 | 150 | 180 |
| From D (m) | | | | | | | |
| Offset (m) | 0.0 | 3.7 | 4.9 | 4.2 | 2.8 | 3.6 | 0.0 |

Determine the area of the tract of land. [10]

QUESTION FOUR

- a) What do you understand by the following terms as they are used in compass Survey?
 - i) Quadrantal bearing [2]
 - ii) Meridian Convergence [2]
 - iii) Magnetic declination [2]
 - iv) Isogonic lines [2]
 - v) Local attraction [2]

- b) The fore bearings and back bearings of a closed loop traverse ABCDA were recorded as below.

| Line | Fore Bearing Degrees, minutes | Back bearing Degrees, minutes |
|------|----------------------------------|----------------------------------|
| AB | 77 30 | 259 10 |
| BC | 110 30 | 289 30 |
| CD | 228 00 | 48 00 |
| DA | 309 50 | 129 10 |
| | | |

Determine which of the stations are affected by local attraction and compute the values of the corrected bearings. [15]

QUESTION FIVE

- a) A T16 theodolite was used to carry out a tacheometry exercise and there was need to determine its stadia constants K and C. Evaluate the stadia constants using the observations below

| Distance (m) | Upper Stadia (m) | Middle Stadia (m) | Lower Stadia (m) |
|-----------------|---------------------|----------------------|---------------------|
| 40 | 1.620 | 1.420 | 1.220 |
| 90 | 1.871 | 1.421 | 0.971 |

[10]

- b) The following data was obtained by stadia tacheometry , vertical angle was $-6^{\circ} 37'$, rod reading of 2.72m was also booked , along with the height of instrument 1.72m and a rod interval of 0.241.

Calculate the following:

- i) Horizontal distance from staff to instrument [5]
- ii) Height difference between instrument and staff position [5]
- iii) Elevation of the staff position given the instrument position level as 185.16m [5]