**SUR – Surveying**

**T024**

**Thursday, 10/11/2016**

**08:30 – 11:30**

WORKFORCE DEVELOPMENT AUTHORITY

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# ADVANCED LEVEL NATIONAL EXAMINATIONS, 2016, TECHNICAL AND PROFESSIONAL STUDIES

**EXAM TITLE: Surveying**

**OPTION: Surveying (SUR)**

**DURATION: 3hours**

## INSTRUCTIONS:

The paper is composed of **three (3) main Sections** as follows:

| | |
|---|---|
| **Section I: Eighteen (18) compulsory** questions. | **55 marks** |
| **Section II**: Attempt **any three (3)** out of five questions. | **30 marks** |
| **Section III**: Attempt **any one (1)** out of three questions. | **15 marks** |

**Note:**

***Every candidate is required to carefully comply with the above instructions. Penalty measures will be applied on their strict consideration.***

**Section I. Eighteen (18) Compulsory questions** **55marks**

**01.** What is the fundamental difference between surveying and leveling? **2marks**

**02.** Discuss at least three (3) different uses of surveying in the construction industry. **3marks**

**03.** State and discuss at least two (2) accessories used for linear measurements. **4marks**

**04.** The distance between point A and Point B was estimated to 1500 m measured with a 20 m chain. The same distance when measured with 30 m chain was found to be 1495 m. Calculate the error in the 30 m chain if the 20 m chain was 40 mm too long. **3marks**

**05.** What is a bench-mark in surveying? **2marks**

**06.** Highlight the difference between:

i. Horizontal and level surfaces
ii. Line of collimation and axis of telescope
iii. Backsight and foresight **6marks**

**07.** What are the arithmetic check for the HI (Height of Instrument) method and the rise-and-fall methods in levelling? **2marks**

**08.** What is a contour line? **1mark**

**09.** Outline at least six (6) specific uses of the contour map. **3marks**

**10.** The area enclosed by contour lines for a proposed dam was recorded from a topographic map and are given in Table below. Find the volume of impounded water using Trapezoidal formula. **3marks**

| Contours (m) | Area enclosed (Ha) |
|---|---|
| 400 | 30 |
| 410 | 110 |
| 420 | 410 |
| 430 | 950 |
| 440 | 1250 |

**11.** State the Simpson's rule for the computation of the area and discuss the considerations and limitations of this rule. **3marks**

**12.** Outline at least six (6) purposes for which a theodolite can be used. **3marks**

**13.** Discuss four (4) different sources of instrument errors in theodolite. **4marks**

**14.** Outline the procedure to be followed for bringing the bubble to the centre when using a theodolite. **2marks**

**15.** With the help of a sketch, explain how you would measure the vertical angle with a theodolite. **6marks**

**16.** How does an electronic theodolite differ from a total station? **3marks**

**17.** Discuss briefly how the total station can be used to carry out topographic survey.

**2marks**

**18.** Outline four (4) sources of error in GPS measurement. **2marks**

**Section II. Choose and answer any three (3) questions.** **30marks**

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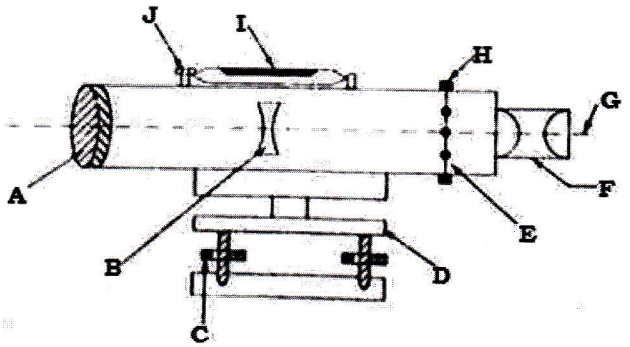
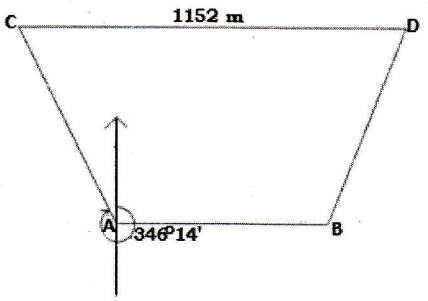
**19.** The following diagram represents the main part of Dump level; please indicate what the labeled parts stand for.




**10marks**

**20.** A and B are two of the stations used in the setting out a construction lines of harbor works. The total latitude and departure of A, referred to the origin of the system are respectively, +542.7 and – 331.2 and those of B are +713.0 and +587.8 (north latitude and east departure being reckoned as positive). A point C is fixed from A at a distance of 432 m on a bearing of 346º14' and from it a line CD, 1152 m in length, is set out parallel to AB as indicated figure below. It is required to check the position of D by sight from B. Calculate the baring of D from B.




**10marks**

**21.** A dumpy level as set up midway between two peg points 80m apart. The readings on the staff at the two pegs were 3.200 m and 3.015m respectively. The instrument was then moved, by 20 m ahead of the second peg, in line with the two pegs. The respective staff readings were 2.825 m and 2.690m. Calculate the staff readings on the two pegs to provide a horizontal line of the sight.

Hint: The two pegs be A and B and the instrument position be C when midway and D when 20m from B the figure look like the following:


**10marks**

**22.** The following offsets were taken from a chain line to an irregular boundary line at an interval of 10 m: 0, 2.50, 3.50, 5.00, 4.60, 3.20, 0 m

Compute the area between the chain line, the irregular boundary line and the end offsets by:

a) The mid-ordinate rule
b) The average - ordinate rule
c) The trapezoidal rule
d) Simpson's rule **10marks**

**23.** The Rwandan ministry of infrastructure and Kigali City Authority after consultation meeting with Ministry of economic and planning to confirm the budget, decided on creating and preparing a ring road that will allow access to different corners of the capital city of Rwanda. As surveyor give minimum of ten processes and steps required for preparation of this new roads at an affordable and reasonable cost. **10marks**

**Section III. Choose and answer any one (1) question.** **15marks**

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**24.** (A) List out and describe the type of angle that can be measured on site while surveying out a given site. Use sketch wherever necessary for more clarification.

(B) By means of table differentiate the important surveying equipment and their appropriate area of application.

**25.** A 30 m length of earth work volume for a proposed road has a constant cross-section of cut and fill, in which the cut area equals to the fill area. The level formation is 10m wide, the transverse ground slope is 20° and the side slope in cut is 0.5 horizontal to 1 vertical. Calculate the volume of excavation in 39 m length.

**26.** Curves are defined as arcs, with some finite radius, provided between intersecting straights to gradually negotiate change in direction.

a) With the above background by sketches discuss types of curves
b) A circular curve has a 200 m radius and 65° deflection angle. Assume the a 30 m chord length, What is its degree:

1) By arc definition
2) By chord definition also calculate
3) Length of curve
4) Tangent length
5) Length of long chord
6) Apex distance and then
7) Mid-ordinate