



**NATIONAL EXAMINATION
AND SCHOOL INSPECTION
AUTHORITY**

T111

Thursday, 29/7/2021

08:30 – 11:30 AM

Names

Index number

TVET NATIONAL EXAMINATION, RTQF LEVEL 5, 2020-2021

QUESTIONS and ANSWERS BOOKLET

OPTION/TRADE: LAND SURVEYING

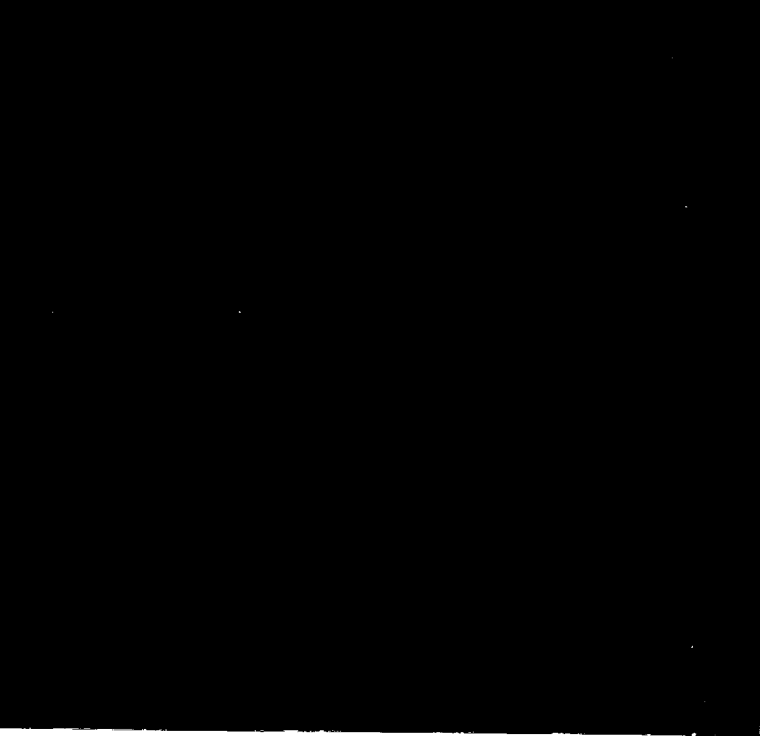
SUBJECT: Road Alignment and Setting out

ACADEMIC YEAR: 2020-2021

Read carefully the instructions on page (i) & (ii).

FOR EXAMINER'S USE ONLY

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TVET NATIONAL EXAMINATION, RTQF LEVEL 5, 2020-2021

INSTRUCTIONS TO CANDIDATES: PART I (Answer Booklet)

1. A candidate should fill in the actual names and the index number on the cover of this questions and answer booklet on the provided place (Black Box).
2. It is illegal for a candidate to write any of his/her names, index number or a school name inside the answer booklet.
3. A candidate should check if all pages of the answer booklet are complete. No candidate should remove or tear any pages or part of it from the answer booklet.
4. A candidate should answer in the language in which the examination is set. (See page **(ii)**)
5. A candidate should sign on the sitting plan when submitting the answer booklet. He/she has also to check if the answer booklet is well sealed.
6. No extra paper is allowed in the examinations room. If a candidate is caught with it his/her results will be nullified.
7. No candidate is allowed to write answers not related to the subject being sat for, otherwise it will be considered as a cheating case.
8. Write your answers on the 12 lined pages (From page 1 of 12 to page 12 of 12).
9. Use the last non-lined pages as draft.
10. Results for any candidate who is caught in examination malpractices are nullified. The cheating can be recognized during examinations administration, marking exercise or even thereafter.

TVET NATIONAL EXAMINATION, RTQF LEVEL 5, 2020-2021

OPTION/TRADE: LAND SURVEYING

SUBJECT: Road alignment and setting out

DURATION: 3 hours

INSTRUCTIONS TO CANDIDATES: PART II (Question Paper)

The paper is composed of two (2) Sections as follows:

Section I: Attempt all the Twelve (12) questions (60 marks)

Section II: Attempt any Four (4) questions out of Six (6) (40 marks)

Allowed materials:

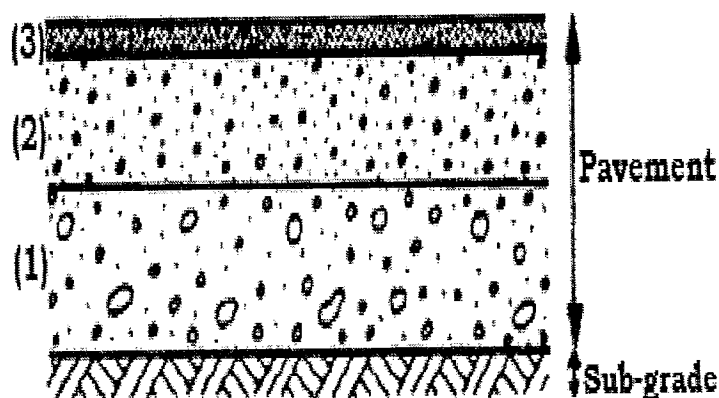
- Ruler or square
- Calculator

Note:

Every candidate is required to carefully comply with the provided assessment instructions.

Section I : Attempt all the Twelve (12) questions**(60 marks)**

- 01.** In constructing and pegging a new road, there are several possible choices of alignments. Summarize at least five (5) essential alignments that can a surveyor respect in using pegging method. **(5 marks)**
- 02.** A new road should be aligned very carefully as improper alignment should result into different disadvantages. State at least four (4) of them. **(5 marks)**
- 03.** Differentiate curve from alignment as used in road setting out. **(5 marks)**
- 04.** Generally, traffic is classified differently according to the considered design standards and sometimes is classified according to the types of vehicles encountered on the road. In order to assess benefits in an economic appraisal (from actual to future users), it is necessary to separate traffic into the three (3) main categories. Enumerate them. **(5 marks)**
- 05.** List any four (4) obstructions in pegging during the new road construction. **(5 marks)**
- 06.** The pavement is the portion of the road, excluding the shoulders, placed above the sub-grade to support and form a running surface for vehicles. It is made up of the three (3) layers namely: sub-base, the base course and the surface or wearing course. Redraw the figure below and complete appropriately the indicated road layers. **(5 marks)**

**(5 marks)**

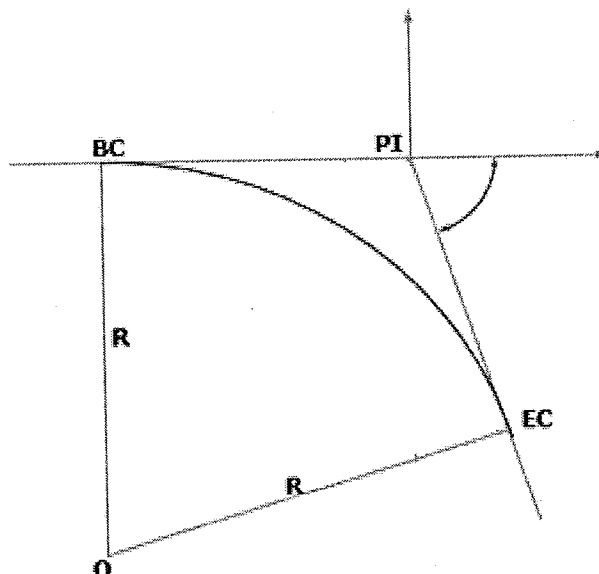
- 07.** Give an expression for finding length of transition curve on horizontal curve by giving the meaning of each letter of that formula. **(5 marks)**
- 08.** Find the total width of a pavement on a horizontal curve for a new national highway to be aligned along a rolling terrain with a ruling minimum radius.
- Assume the following data:
- National highway on rolling terrain, ruling design speed(V)=80kmph.
 - Normal pavement width(w)=7.0m
 - Number of lanes $n=2$
 - Wheel base of the truck $e=0.07$ and skid resistance $f=0.15$
- (5 marks)**
- 09.** State five (5) factors to be considered while designing length of transition curve. **(5 marks)**
- 10.** The vertical alignment of the road has a strong influence upon: construction cost, the operation cost and on the number of accidents. List any two (2) elements of vertical alignment. **(5 marks)**
- 11.** A contour plan or map is very much useful in locating the route of highway or any other communication line. Differentiate the terms "contour line" from contour map" **(5 marks)**
- 12.** The camber is one of the elements that compose the cross section of the road. As a Land surveyor,
- a) Explain briefly what is camber in cross section of the road. **(1 mark)**
 - b) Enumerate at least four (4) functions of camber you know. **(4 marks)**

Section II: Attempt any Four (4) questions out of Six (6) (40 marks)

13. Horizontal Curve; Circular Curve; Simple curve; Compound Curve; Reverse Curve; Transition Curve; Cubic parabola; Spiral Curve; Lemniscate; Vertical Curve; Summit Curve and Valley Curve are the types of curve.

Starting from the main types to their branches, make the order clearly. **(10 marks)**

14. The figure below illustrates a road curve set out and the following data are considered: Deflection angle $\Delta = 16^\circ 38'$; Radius of curvature $R = 1,000\text{ft}$; Point of intersection **PI** is at **6+26.57**; and the peg interval is **100ft**.



Calculate:

- (i) Tangent length (**T**)
- (ii) Length of the curve (**l**)
- (iii) Station at **BC** and **EC**
- (iv) Long chord (**L**)
- (v) Mid-ordinate (**M**)
- (vi) External distance (**E**).

(10 marks)

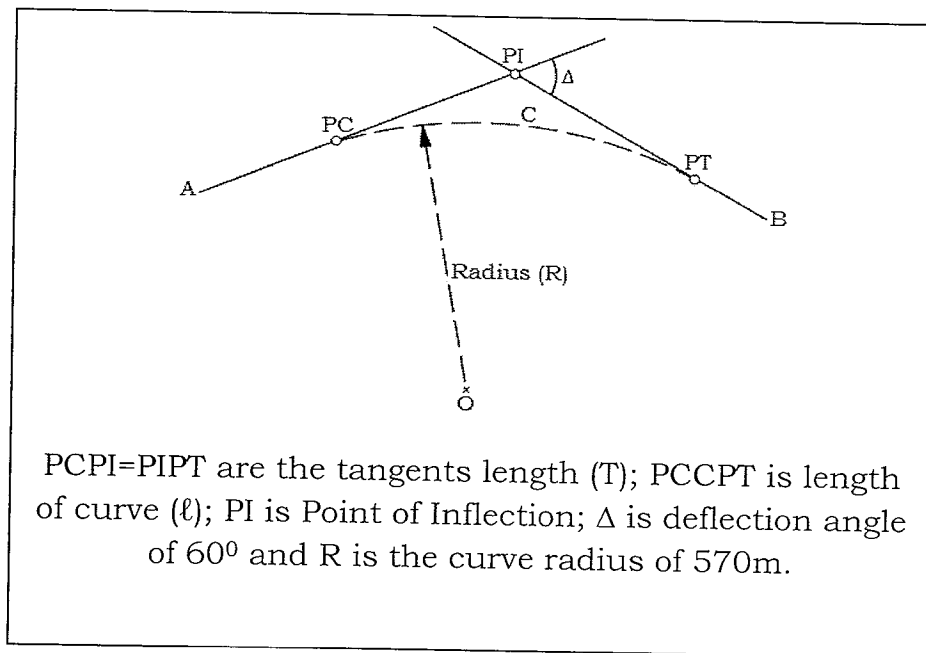
15. Road is one of the major factors which connect town and centres. Write any ten (10) importance of roads. **(10 marks)**

16. A circular simple horizontal curve has 200m radius and deflection angle of 65° . Calculate:

- a) The length of curve (**L**)
- b) The tangent length (**T**)
- c) The length of long chord (**d**)
- d) Mid ordinate (**f**).

(10 marks)

17. The figure below is representing setting out of road simple circular curve. Observe it attentively and choose the correct answer carefully:



- (a) Tangent length (PCPI=PIPT) is: (i) 329.809m; (ii) 329.098m; (iii) 329.089m
- (b) Length of curve (PCCPT) is: (i) 596.06m; (ii) 596.96m; (iii) 596.60m
- (c) Long chord(PCPT) of the curve is: (i) 750m; (ii) 507m; (iii) 570m
- (d) External distance (PIC) is: (i) 88.197m; (ii) 88.971m; (iii) 88.179m
- (e) Mid-ordinate (M) of the curve is: (i) 76.356m; (ii) 76.563m; (iii) 76.365m

Note: Please! Show all your possible ways (reasons) of how you get the answers. **(10 marks)**

18. The road Ruyenzi- Gihara in KAMONYI District is under construction.

There are some materials; tools and surveying instruments such as Reference pegs; Tape measures; Profile Boards and Ranging Rods; Traveller; Optical Square; Tube Water Level; Abney Level; Dumpy level; Theodolite and Total station are used in road Construction. Indicate the role of each element.

(10 marks)

