



# TVET NATIONAL EXAMINATIONS, LEVEL 5, 2022-2023

## INSTRUCTIONS TO CANDIDATES (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.
2. It is illegal for a candidate to write any of names, Index number or school name inside the answer booklet.
3. No candidate should remove or tear any pages or part of it in the answer booklet.
4. A candidate should answer in the language in which the examination is set.
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 16 lined pages (From page 7 to page 22).
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.

- N.B:** 1) After results publication, there is no remarking and no candidate is given his/her answer booklet for review. This answer booklet is a property of NESAs.
- 2) Claims are only received online within 30 days after results publication. A link will be provided after results publication.

**T 137\_ RF and Microwave antenna system installation**

**TVET NATIONAL EXAMINATIONS, LEVEL 5, 2022-2023**

**OPTION/TRADE: TELECOMMUNICATION**

**SUBJECT/EXAM: RF AND MICROWAVE ANTENNA SYSTEM INSTALLATION**

**DURATION: 3 HOURS**

**INSTRUCTIONS TO CANDIDATES (QUESTION PAPER)**

**This Exam paper is composed of Three Sections (A, B, and C). Follow the instructions given below, and answer the indicated questions for a total of 100 marks**

**Section A: Fourteen (14) questions, all **Compulsory** 55 marks**

**Section B: Among the five (5) questions, attempt any three (3) 30 marks**

**Section C: Among the two (2) questions, attempt any one (1) 15 marks**

**Allowed materials:**

- Blue or black pen
- Mathematical set
- Non-programmable calculator

**Note:**

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

## **T 137\_ RF and Microwave antenna system installation**

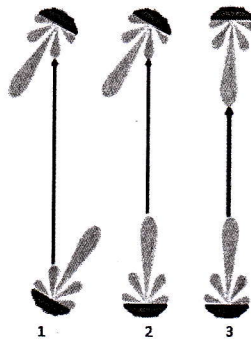
### **SECTION A: Attempt all questions**

**(55 marks)**

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- 01.** Explain the following terms: **(4marks)**
- a) Directivity,
  - b) Radiation pattern,
  - c) Power density,
  - d) Radiation intensity.
- 02.** Enumerate the five (5) steps to follow while connecting Microwave ODU to Microwave IDU. **(5marks)**
- 03.** List the three (3) types of RF antenna according to the frequency band. **(3marks)**
- 04.** Give any six (6) characteristics of an antenna. **(3marks)**
- 05.** State the two (2) main functions of an antenna. **(2marks)**
- 06.** Identify any four (4) consumables used to install RF antenna. **(4marks)**
- 07.** Differentiate circular polarization from elliptical polarization with the help of sketches **(4marks)**
- 08.** Explain two (2) main parts of a parabolic reception antenna. **(4marks)**
- 09.** Choose any five (5) right answers in relation to the use of waveguide: **(5marks)**
- a) To carry high frequency radio waves, particularly microwaves.
  - b) It is used in electrical installation.
  - c) Waveguide is used in communication system.
  - d) It is mostly used in electrical installation.
  - e) Waveguide is used in the devices of navigation aids.
  - f) To carry current, particularly in microwaves.
  - g) It is used to handle high power energy.
  - h) Waveguide is used in cellular network system.
  - i) It is mostly used in airborne radar.
  - j) Waveguide is the devices used in fiber optics.
- 10.** Draw a splitter device and give its function during installation. **(4marks)**
- 11.** The driven element of Yagi antenna is 900 mm, what is its operating frequency? **(4marks)**

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12. The following figures show a cable free microwave antenna alignment that avoid Side lobes. Among these figures which figure is correct. Justify your answer.



13. A parabolic reflector that has a dish diameter of 3m is used to receive a 10 GHz signal. The illumination efficiency of the antenna is 0.55 and the focal length is 0.6 m. Determine the effective area, directivity, the Beamwidth between the nulls, and the depth of the reflector.
14. Match column A with column B.

Column A	Column B
1. RF up converter/down converter	A. This module provides low noise amplification to the received signal from the satellite
2. AF Amplifier	B. It used to increase noise into a system
3. NPU	C. Transducer which converter electromagnetic signal to electrical signal
4. Transceiver	D. It converts modulated RF to modulated IF.
5. LNA	E. It helps in segregating both transmit and receive frequency.
6. Speaker	F. It converts modulated RF to modulated IF.
7. Modulator	G. It converts modulated IF to modulate RF as per band i.e., C band or Ku band.
8. OMT	H. This module provides amplification to the signal output of the RF up converter before transmission via RF antenna

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## Section B: Attempt any three (3) questions

(30 marks)

15. The following figure is a typical split-mount point to point Microwave (10marks)  
system. Explain its operation and give the functions of each element  
that constitutes it.

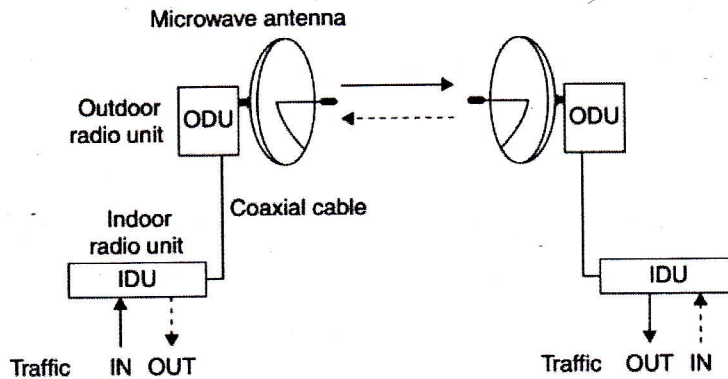
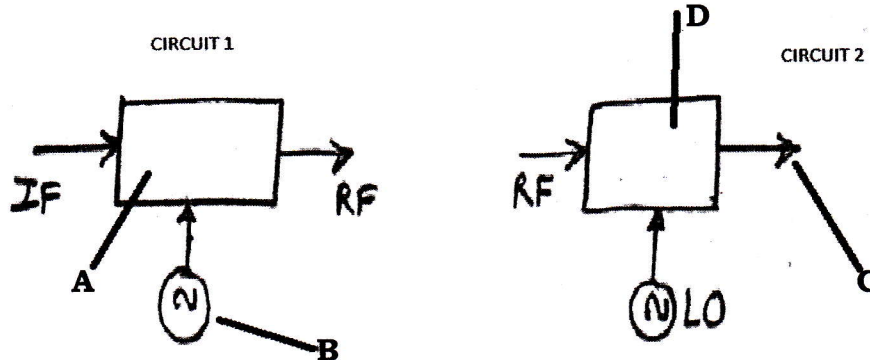


Figure 2.6 Typical split-mount point-to-point microwave system

16. Compare the wave guide and the transmission line. (10marks)

17. Observe the figures below, and answer to the questions: (10marks)



- Name the parts mentioned on parts A, B, C, D
- Give the function of circuit 1 and circuit 2

18. In microwave system, we have two different ways of mounting the microwave ODU to the antenna.

- Mention those types, (4marks)
- Discuss the importance of each way. (6marks)

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19. A company of Telecommunication would like to build a Microwave link. (10marks)  
Suppose that the activities of site survey are ended. As a technician, talk about the all-remaining activities of site construction and equipment installation.

**Section C: Attempt only one (1) question**

**(15 marks)**

20. Design a Yagi-Uda antenna having one driven element and one reflector element with three director elements that transmit EM waves at ( $f = 300$  MHz). The spacings between elements should be respected. (15marks)
21. By using a sketch, discuss the difference between Separate mount and Direct mount of ODU with IDU. (15marks)

**END OF ASSESSMENT**