JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF EDUCATION (SCIENCE)

MAIN

REGULAR

COURSE CODE: SPH 419

COURSE TITLE: TELECOMMUNICATIONS SYSTEMS

EXAM VENUE: **STREAM: (BED SCI)**

DATE: **EXAM SESSION:**

TIME: 2:00HRS

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1. **<u>Instructions:</u> Answer question 1 (Compulsory) in Section A and ANY other 2 questions in Section B.**
2. **Answer Question 1 (compulsory) and ANY other 2 questions**
3. **Candidates are advised not to write on the question paper.**
4. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

QUESTION ONE COMPULSORY (30 MARKS)

a. Define the term telecommunication **(2 marks)**
b. State and explain any three types of telecommunication transmision media (3 marks)
c. Give three advantages of satellites communications. **(3 marks)**
d. Name the parts (waves) of the electromagnetic spectrum used in telecommunication industry and state the telecommunication system each is applied **(3 marks)**
e. i) Define the term demodulation **(1mark)**
   ii) Give two functions of a demodulator **(2 marks)**

f. Give any three advantages of frequency modulation over amplitude amplification **(3 marks)**
g. Define the term noise as used in telecommunication **(1 mark)**
h. The signal power at the input to a receiver is 7.8 mW and the noise power at the input to that receiver is 2.5 mW. Find
   i. The Signal to Noise Ratio **(2 marks)**
   ii. The signal to Noise ratio in decibels **(2 marks)**
i. Derive the equation for the maximum range of a radar system (4 marks)
j. Name and briefly describe the four types of fiber optics **(4 marks)**

QUESTION TWO (20 MARKS)

a. draw a schematic artchitecture of the Radio Broadcasting, Transmission and Reception System explaining the functions of the principal parts **(8 marks)**
b. Define modulation as used in telecommunication **(2 marks)**
c. Using illustrative waveform diagrams, give full account of
   i. Frequency modulation
   ii. Amplitude modulation **(6 marks)**

d. Derive the equations for instateneous voltage of Amplitude modulated wave and give its full implication **(4 marks)**

QUESTION THREE (20 MARKS)

a. In order to reproduce the A.M. wave into sound waves, every radio receiver must perform several functions. Outline the functions of a radio receiver stepwise (6 marks)
b. Draw the schematics of the following types of AM radio receivers and fully explain their operations
   i. Straight wire radio receiver (4 marks)
   ii. Superhetrodyne radio receiver (5 marks)
c. Using a well labelled block diagram, explain the operation basics of an FM receiver (5 marks)

QUESTION FOUR (20 MARKS)

a. Draw the schematic well labelled Block Diagram of the radar communication system **(2 marks)**
b. Explain the working mechanism of the radar communication system drawn in a above **(5 marks)**
c. Using an illustrative diagram, fully explain the satellite communication process **(4 marks)**
d. There are the three important types of Earth Orbit satellites namely Geosynchronous Earth Orbit Satellites; Medium Earth Orbit Satellites; Low Earth Orbit Satellites.
   Briefly discuss each of them giving their specific applications **(9 marks)**

QUESTION FIVE (20 MARKS)

a. Draw a fully labelled schematic architecture of the basic fiber optic link and explain the functions of the principal components **(8 marks)**
b. Briefly describe the following types of optical fibers
   i) Step-index multimode fiber
   ii) Step-index single mode fiber
   iii) Graded-index fiber. **(6 marks)**
c. A 10-km fiber optic communication system link has a fiber loss of 0.30 dB/km. Find the output power if the input power is 20 mW. **(3 marks)**
d. Give any three advantages of fibre optics communication **(3 marks)**