

**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND
TECHNOLOGY
UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF
EDUCATION (SCIENCE)**

**MAIN
SPECIAL RESITS**

COURSE CODE: SPB 9428

COURSE TITLE: TELECOMMUNICATIONS SYSTEMS

EXAM VENUE: STREAM: (BED SCI)

DATE: EXAM SESSION:

TIME: 2:00HRS

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- 1. Instructions: 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. Distinguish between modulation and demodulation as used in radio telecommunication system (4 marks)
- b. In an Amplitude modulated signal, the maximum amplitude is 6.5V while the minimum amplitude is 3.5V. Calculate the modulation index (3 marks)
- c. Derive the equation for total power radiated by an Amplitude modulated carrier wave. (3 marks)
- d. The signal power at the input to a receiver is 10.2 mW and the noise power at the input to that receiver is 3.0 mW. Calculate
 - i. The Signal to Noise Ratio (2 marks)
 - ii. The signal to Noise ratio in decibels (2 marks)
- e. Write down and briefly explain the radar equation (2 marks)
- f. Distinguish between passive and active satellites 2 marks
- g. Obtain the relationship between the critical angle and the refractive index of an optical fibre. (3 marks)
- h. Using a well labeled diagram, explain how a light signal is guided through an optical fibre medium from the transmitter to the receiver end (3 marks)
- i. Define the following terms as used in telecommunications systems (6 marks)
 - i) Transponder
 - ii) Carrier swing
 - iii) Single mode laser

QUESTION TWO **(20 MARKS)**

- a. draw a schematic architecture of the Radio Broadcasting, Transmission and Reception System explaining the functions of the principal parts (8 marks)
- b. Draw the schematics of the following types of AM radio receivers and fully explain their operations
 - i. Straight wire radio receiver (6 marks)
 - ii. Superhetrodyne radio receiver (6 marks)

QUESTION THREE (20 MARKS)

- a. Using a schematic block diagram, fully explain the working mechanism of a satellite communication system
(10 marks)
- b. Give a detailed account about the three categories of satellites as per the orbits (10 marks)

QUESTION FOUR (20 MARKS)

- c. Draw the schematic well labelled Block Diagram of the radar communication system (4 marks)
- d. Explain the working mechanism of the radar communication system drawn in a above (6 marks)
- e. State and fully discuss any five sources of **System Losses** in radar telecommunication system (10 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 (12 marks)
- b. In an optical fibre system, the cladding and the core have refractive indices of 1.6 and 1.2 respectively. Determine the minimum angle at the cladding-core interface at which an optical signal must be fed at the transmitter end for the wave to undergo full the propagation through the fibre length (4 marks)
- c. State and explain any three advantages of cladding in an optical fibre m 3 marks
- d. State any four benefits of using fibre optics communication (3 marks)

