

**TECHNICAL UNIVERSITY OF KENYA**

**FACULTY OF APPLIED SCIENCES AND TECHNOLOGY**

**SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY**

**END OF SEMESTER EXAMINATION SERIES**

**FIRST SEMESTER EXAMINATIONS 2018/2019**

**THIRD YEAR SUPPLEMENTARY EXAMINATIONS FOR THE**

**BACHELOR OF TECHNOLOGY IN COMMUNICATION AND COMPUTER NETWORKS**

**ECCI 2207: TELECOMMUNICATION PRINCIPLES**

TIME: 2 Hours

**Instructions to candidates:**

This paper consists of FIVE Questions.

Answer Question ONE [30 Marks] and any other TWO Questions [20 Marks Each].

Write your college number on the answer sheet.

This paper consists of 4 printed pages

**Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**

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**Q1**(a) Explain the following terms with reference to the Telecommunication systems:

(i)Amplitude Modulation

( ii) Frequency Modulation (4Mar)

(b)With the aid of a diagram show the frequency spectrum of amplitude modulated

wave for a commercial modulating signal (300 to 3400) Hz.. (3Marks)

(c)Explain the need of the modulation process in the Telecommunication systems

when the information to be transmitted is send through space ( 4 Marks)

(c) Explain the role of the ITU Standardization Sector (3Marks)

(d) Explain the following types of noise which can occur in Telecommunication systems

(i) Thermal noise

(ii) partition noise (6Marks)

(e) Outline Four advantages of optic fiber as compared to coaxial cables (4Marks)

(f) Explain how a standing wave occurs on a transmission line (2Marks)

(g) With the aid of a waveform diagram show the frequencies contained in an amplitude

modulated wave when the modulating signal is 1 KHZ. (4Marks)

**Q2)**(a) (i) With the aid of a diagram explain the functions of the parts which make the basic

structure of an optic fiber

(ii)Draw a block diagram of a typical point- to- point fiber optic communication

system .

(13Marks)

(b) Explain the following types of optic fiber and their applications

(i)Single-mode fiber

(ii) [Multimode fiber](http://searchnetworking.techtarget.com/definition/multimode-fiber) (4Marks)

(c)Explain how Rayleigh scatter losses can occur in an optic fiber (3Marks)

**Q3**)(a)With reference to frequency modulation explain the meaning of the following terms:

(i) Rated system deviation

(ii) Deviation ratio (5Marks)

(b) A100 MHZ carrier wave is frequency modulated by a 10V, 10 KHZ sinusoidal voltage

using a Linear modulator .The instantaneous carrier frequency varies between 99.95

and 100.05MHZ . Determine the following:

(i)The modulator sensitivity

(ii)Modulation index

(5Marks

(c) An AM signal consists of the following two signals:

Vm(t) = 80Sin (2Пx1000t ) volts

Vc(t) = 100 Sin (2П 800x1000t) volts

Determine the following:

(i)The carrier frequency

(ii)The upper and lower sideband frequencies

(iii) Modulation index

(iv)The expression for the resulting AM signal (10Marks)

**Q4)**(a)Explain the following terms with reference to Teleommunication systems:

( i) Signal to noise ratio

**(**ii) Noise figure (6Marks)

(b)Explain the cause of external noise which can affect communication system. (6Marks)

(c)Three matched amplifiers are available to amplify a low level signal. They have the

characteristics shown in Table 1 below .

(i)Compare the **noise figure** of the amplifiers connected in cascade in ABC and ACB

arrangement.

(ii)Determine the order in which the amplifiers should be connected.

|  |  |  |  |
| --- | --- | --- | --- |
| Amplifiers | A | B | C |
| Power Gain | 4 | 16 | 100 |
| Noise Factor | 1.7 | 2.0 | 4 |

Table1

(8Marks)

**Q5**(a) Explain the following terms with reference to transmission lines:

(i) Voltage Standing Wave Ratio.

(ii) Reflection coefficient (2Marks)

(b) A radio frequency transmission line has an inductance of 260nH per metre and a

capacitance of 46Pf per metre. Find

(i)The characteristic impedance

(ii) The phase change coefficient

(iii)The phase velocity of propagation (8Marks)

(c) Compare the merits of frequency modulation to those of amplitude

modulation and deduce the one which gives a better performance (6Marks)

(d)The power dissipated by an amplitude modulated wave is 100 W when its depth of

modulation is 40%. Find modulation depth (m)necessary to increase the power to 120W

(4Marks)