National University of Computer and Emerging Sciences

Lahore Campus

Analog & Digital Communication (EE3003)

Sessional-II Exam

Total Time (Hrs): 1
Total Marks: 45
Total Questions: 3

Date: November 04, 2024

Course Instructor(s)

1. Dr. S. M. Sajid (CM)
2. Mohsin Yousuf

Roll No _____ Section _____ Student Signature _____

Do not write below this line

1. **Attempt all questions and remember to solve parts of the same question together.**
2. **Show all the steps with the help of diagrams and equations.**

CLO # 03: Demonstrate the concept of analog amplitude modulation and demodulation techniques

Q1: **[15 marks]**

(a) **Describe** the principle of operation of a Switching Modulator clearly illustrating (through time and frequency domain representation) the conversion of a message signal, $m(t)$ to a modulated signal of the form $m(t)\cos\omega_c t$. **[10]**

[Block diagram of the modulator is not required in this part; the concept of periodic on-off switching has to be utilized].

(b) **Draw** complete circuit diagram of a "Ring Modulator" and prove that it achieves the switching operation. **[5]**

CLO # 03: Demonstrate the concept of analog amplitude modulation and demodulation techniques

Q2: **[15 marks]**

(a) **Define** coherent demodulation and **draw** its general block diagram. **[4]**

(b) **Describe** the main difference between *envelope detector* and *rectifier detector* as used in conventional AM. **[4]**

(c) We want to detect the message signal, $m(t)$ from a conventional AM signal, $[A + m(t)]\cos\omega_c t$, (regardless of the value of A) using *coherent detector* in part (a) with slight modification. **Draw** the block diagram and **write** the equations for each block. *(Remember to achieve exactly $m(t)$ at the output).* **[7]**

National University of Computer and Emerging Sciences
Lahore Campus

CLO # 04: Demonstrate the concept of analog frequency modulation and demodulation techniques

Q3: An angle-modulated signal with carrier frequency, $\omega_c = 2\pi \times 10^6$ rad/s is described by, **[15 marks]**

$$\varphi_{EM}(t) = 10\cos(\omega_c t + 0.1\sin 2000\pi t)$$

(a) Find the power of modulated signal. **[2]**

(b) Find frequency deviation, Δf. **[6]**

(c) Find phase deviation, $\Delta\varphi$. **[2]**

(d) Estimate the bandwidth of $\varphi_{EM}(t)$. **[5]**