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PRESIDENCY UNIVERSITY BENGALURU

SCHOOL OF ENGINEERING

SUMMER END-TERM EXAMINATION- AUGUST 2024

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| **Semester: IV** | **Date :5-08-2024** |
| **Course Code: ECE3005** | **Time :09.30AM to 12.30 PM** |
| **Course Name: Analog Communication** | **Max Marks :100** |
| **Program: BTech** | **Weightage :50%** |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Question paper consists of 3 parts.*
3. *Scientific and non-programmable calculator are permitted.*
4. *Do not write any information on the question paper other than Roll Number.*

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| **PART A** | | | |
| **ANSWER ANY 4 QUESTIONS 5Q X 4M=20M** | | | |
| 1 | State sampling theorem. List different types of sampling. | (CO 1) | [Knowledge] |
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| 2 | The envelope detector is a simple RC circuit in combination with Low Pass Filter that is used to demodulate conventional AM waves. A message signal m(t)=COS (2000πt)+ COS (3000πt) modulates the carrier signal c(t)= COS (2πfct) (where fc= 4 MHz) to generate the AM signal. To demodulate the AM signal using the envelope detector, estimate the RC time constant of the circuit. | (CO 1) | [Knowledge] |
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| 3 | For the AM wave to be properly detected using an envelope detector, the modulation index should be less than 100%. Based on this concept, a carrier wave with an amplitude 12 V and frequency fc=20Mhz is amplitude modulated to 50% level using a modulating signal with frequency fm=2 Khz. Write down the equation of the AM wave | (CO 1) | [Knowledge] |
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| 4 | The parameter modulation index, provides information on the depth of modulation the baseband signal incurs on the carrier signal. Knowledge of the value of the modulation index plays a vital role, particularly in the case of amplitude modulation. In a laboratory, while performing an experiment of AM, a student measures the following values from the DSO: Vmax=5V, Vmin=1.5V. What can be the value of the modulation index in percentage measure? | (CO 1) | [Knowledge] |
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| 5 | If sampling signal frequency is less than the twice of the input signal frequency they were unable to recover the signal input signal x(t). Identify this effect. List the conditions to remove this effect. Draw the spectrum for various sampling conditions. | (CO 1) | [Knowledge] |
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| 6 | Define Angle modulation. Discuss the relation between Frequency modulation (FM) and Phase Modulation (PM). | (CO 1) | [Knowledge] |
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| **PART B** | | | |
| **ANSWER ANY 4 QUESTIONS 4Q X 10M=40M** | | | |
| 7 | In FM system, the instantaneous frequency of the carrier wave is varied directly in accordance with the message signal by means of device known as voltage controlled oscillator. How ever to attain good oscillator stability series of multiplier and mixers are used as shown in below fig. Find out the carrier frequency, frequency deviation and modulation index at the points A and B. Assume that at the output of the mixer, the additive frequency component is being selected. | (CO2) | [Comprehension] |
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| 8 | Demodulation is extracting the original information-bearing signal from a carrier wave. Discuss FM demodulation using Pre-Emphasis and De-Emphasis technique. | (CO2) | [Comprehension] |
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| 9 | The modulation techniques are classified into two major types: analog and digital or pulse modulation. Discuss difference between PAM,PWM and PPM. | (CO2) | [Comprehension] |
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| 10 | A single tone modulating wave m(t) =Am Cos2pifmt is applied to a Narrow band Frequency modulation (NBFM). The output expression is given as s(t)=Ac Cos(2pifct+ßSin2pifmt) where ß<< 1radians. Identity the differences observed between NBFM and Amplitude modulation with relevant expression and spectrum diagram. | (CO2) | [Comprehension] |
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| 11 | A multiple-tone amplitude modulation is that type of modulation in which the modulating signal consists of more than one frequency components. Derive an expression for multi-tone Amplitude Modulation. | (CO2) | [Comprehension] |
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| 12 | A Zero Crossing Detector Circuit is used to track the changing in the sine/pulse waveform from positive to negative or vice versa while it crosses Zero voltage. With a neat block diagram and waveform show zero cross detector for frequency demodulation. | (CO2) | [Comprehension] |
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| **PART C** | | | |
| **ANSWER ANY 2 QUESTIONS 2Q X 20M=40M** | | | |
| 13 | Demodulation is extracting the original information-bearing signal from a carrier wave. Discuss FM detection using i) Frequency Discrimination or Simple slope detector ii) Phase Locked Loop (PLL). | (CO3) | [Application] |
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| 14 | In an AM broadcasting station the audio frequency is represented as 5Sin2π(1000)t and the station is using a carrier of 100Sin2π(106)t. Consider modulation index as 0.4.  Estimate the following parameters:  1.side band frequencies  2. Amplitude of each side band  3.Find bandwidth required to transmit the AM modulated signal.  4.Total power delivered to a load of 100Ω. | (CO3) | [Application] |
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| 15 | A RED FM station in Bangalore uses 93.2MHz carrier; which is frequency modulated by an audio signal of 5kHz sine wave. The resultant FM signal has frequency deviation of 40kHz.  a) Find the carrier swing of the FM signal.  b) What are the highest and lowest frequencies attained by the frequency modulated signal?  c) Calculate the modulation index for the wave.  d) Calculate Band width. |  |  |
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