SASTRA DEEMED UNIVERSITY

(A University under section 3 of the UGC Act, 1956)

End Semester Examinations **May 2023**

Course Code: **ECE202**

Course: **ANALOG COMMUNICATION**

QP No. :**U018-4** Duration: **3 hours**

Max. Marks:**100**

PART – A

Answer all the questions **10 x 2 = 20 Marks**

1. List two reasons why modulation is necessary for an electronic communication system?

2. A sinusoidal signal of $6\sin(\omega_m t)$ is amplitude modulated by a carrier of $4\sin(\omega_c t)$. Find the depth of modulation and also specify whether the modulated signal is appropriate for the reception?

3. With the necessary illustration, explain Vestigial Side Band modulation. Why is it used in TV systems?

4. The maximum deviation allowed in an FM broadcast system is 75KHz. If the modulating signal is a single-tone sinusoid of 8KHz, determine the bandwidth of the FM signal. What will be the bandwidth when the modulating signal amplitude is doubled?

5. Find the modulating frequency and the maximum deviation of the FM wave represented by the voltage equation $V = 12\sin(6 \times 10^8 t + 5\sin 1250t)$.
6. What is the need for preemphasis and deemphasis circuits in FM radio systems?

7. List out the salient features of the broadcast receiver.

8. Distinguish between the function of the frequency multiplier and a mixer.

9. A resistor of 20KΩ is connected at the input of an amplifier operating over the frequency range of 10 to 11MHz. Compute the RMS noise voltage at the input of the amplifier if the ambient temperature is 24°C.

10. Define the Capture effect in FM.

PART – B

Answer any FOUR questions **4 x 15 = 60 Marks**

11. (a) A modulating signal $e_m(t) = E_{m1}\sin\omega_{m1}t + E_{m2}\sin\omega_{m2}t$ amplitude modulates a carrier $e_c(t) = E_c\sin\omega_c t$. Develop the mathematical expression for AM wave and find the bandwidth. (8)
    (b) Explain the necessary circuit to generate the DSB-SC AM signal. (7)

12. (a) Describe the working of a linear diode detector with a circuit diagram and derive the expression for the maximum value of time constant RC in a linear diode detector to avoid negative peak clipping. (12)
    (b) Compare different AM systems. (3)

13. (a) Explain the indirect method of generating FM waves with a neat block diagram and phasor diagram. (10)
    (b) Compare NBFM and WBFM. (5)

14. (a) Construct and explain the transmitter using the following specifications. An input frequency range of 1Hz – 3KHz, a low frequency carrier of 100KHz, a medium frequency carrier of 3MHz and a high-frequency carrier of 12MHz. Also, sketch the block diagram. (9)
    (b) What are the factors influencing the choice of IF? (6)

15. Draw the block diagram of AM superheterodyne receiver and explain its operation and the functions of each stage.

16. Show that the figure of merit for a DSB-SC system is unity.

PART – C

Answer the following **1 x 20 = 20 Marks**

17. (a) It is required to provide a maximum deviation of 75KHz for the 88MHz carrier of a VHF FM transmitter. A FET is used as a capacitive reactance modulator, and the linear portion of its $g_m - V_{gs}$ curve lies from 320μS at which $V_{gs} = -2V$ to 830μS at which $V_{gs} = -0.5V$. Assuming that R_{gs} is one-tenth of $X_{C_{gs}}$, calculate the value of the fixed capacitance and inductance of the oscillator-tuned circuit across which the reactance modulator is connected. (6)
    (b) Explain how the FMFB can be used for the performance improvement of the FM system. (8)
    (c) Compare the Amplitude and Angle modulations. (6)

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