Final Assessment Test (FAT) - APRIL/MAY 2023

Programme	B.Tech	Semester	Winter Semester 2022-23
Course Title	ANALOG COMMUNICATION SYSTEMS	Course Code	BECE304L
Faculty Name	Prof. Nagajayanthi B	Slot	F1+TF1
		Class Nbr	CH20222235001131
Time	3 Hours	Max. Marks	100

PART-A (2 X 10 Marks)
Answer All questions

01. (i) Can a baseband signal of frequency 1kHz be transmitted using a half wavelength antenna? If so, what would be the height of the antenna required? Can this height be achieved practically? Justify with solutions. (5 marks)   [10]

(ii) How would you set up your own AM/FM radio station? Which (AM or FM) is more suitable for long distance transmission and which is more affected by noise? Why? How does the signal from the radio station reach your receiver at your home? (5 marks)

02. How can you view multiple channels operating at different frequencies in a television with reduced crosstalk? Illustrate the concept involved along with transmission and reception? Suggest on the type of appropriate input signal.   [10]

PART-B (4 X 15 Marks)
Answer All questions

03. (i) The amplitude of a high frequency sinusoidal signal is varied in accordance with the amplitude of a low frequency sinusoidal signal. The resulting modulated wave is given by: $s(t)=20[1+0.8\cos(2\pi\times10^{3}t)]\cos(4\pi\times10^{5}t)$. Find the carrier power, total sideband power, total bandwidth, and its modulation efficiency. Also plot the resulting spectrum of the modulated wave. (10 marks)   [15]

(ii) Describe the working principle of an envelope detector and comment on the choice of time constant (RC) value for reduced distortion. Highlight on the type of distortions encountered due to incorrect values of RC. (5 marks)

04. Apply DSB-SC signal and SSB-SC signal as the input to a coherent detector. What would happen if the carrier signal at the sending end and at the receiving end are not synchronized in phase? Justify mathematically the effect of phase shift in the carrier at the receiving end.   [15]

05. How does each component in the superheterodyne receiver contribute towards an ideal receiver? How is the constant intermediate frequency obtained in an IF amplifier and why? Why is AGC and AFC required in a superheterodyne receiver?   [15]

06. Derive the figure of merit for a FM system. Justify that the noise performance of an FM system is superior when compared to an AM system.   [15]

PART-C (1 X 20 Marks)
Answer All questions

07. (i) For an FM modulator with modulating signal ($E_m \sin 2\pi 1000 t$) and an unmodulated carrier ($10 \sin 2\pi*5*10^5 t$) of unity modulation index, determine the number of significant sidebands and bandwidth. Plot the corresponding spectrum. What is the correlation between bandwidth and   [20]

the number of sidebands? (12 marks)

Given:

m_i	J_0	J_1	J_2	J_3
1.0	0.77	0.44	0.11	0.02

(ii) A single tone frequency modulated signal is given by $12 \cos (6 *10^8 t - 5 \sin 1250 t)$. Determine the carrier frequency, modulating frequency, modulation index, maximum frequency deviation, type of FM signal, and the power dissipated by the FM wave in a 10K resistor. (8 marks)

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