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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E. **Semester: V**
Branch: Electronics and Communication Engineering **Duration: 3 hrs.**
Course Code: 16EC5DCCT1 **Max Marks: 100**
Course: Communication Theory-1

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

SUPPLEMENTARY EXAMS 2023

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
Revealing of identification, appeal to evaluator will be treated as malpractice.

UNIT - I

1	a)	Explain mean, correlation and covariance function of a random process x(t)	**10**
	b)	Discuss and Analyse the effect of Noise in communication Scenario and also explain how Noise is classified	**10**

UNIT - II

2	a)	Derive an expression for the efficiency of AM, how is this improved in DSBSC.	**06**
	b)	The maximum peak-to-peak voltage of an AM wave is 16 mV and the minimum peak-to-peak voltage is 4 mV. Calculate the modulation factor.	**04**
	c)	Derive the expression for figure of merit of DSB-SC receiver	**06**
	d)	A carrier wave of 500 watts is subjected to 100% amplitude modulation. Determine (i) power in sidebands (ii) power of the modulated wave.	**04**

OR

3	a)	Show that a square law can be used for the detection of an AM Wave	**05**
	b)	Explain the generation of DSBSC wave using ring modulator.	**06**
	c)	Explain with a neat block diagram Quadrature Carrier Multiplexing.	**05**
	d)	An AM wave is represented by the expression: $v = 5 (1 + 0.6 \cos 6280t) \sin 211 \times 10^4 t$ volts (i) What are the minimum and maximum amplitudes of the AM wave? (ii) What frequency components are contained in the modulated wave and what is the amplitude of each component?	**04**

UNIT - III

4	a)	With a neat block diagram explain frequency division multiplexing.	**06**
	b)	Show the construction of Synchronous detector used to demodulate SSB Signal, Sketch the spectrum also write the time domain expression of the signal.	**10**

c) Consider the bandwidth of a signal 20KHz and the midband frequency range 0.615 - 1.715MHz. It is required to translate this signal to a fixed frequency band centered at 0.475MHz. Determine the range of tuning that must be provided in the local oscillator to perform necessary frequency translation. **04**

OR

5 a) Given S(t), define the pre-envelop and complex envelop. Is it possible to calculate these quantities from each other. **05**

b) The carrier frequency in an FM modulator is 1000 kHz. If the modulating frequency is 15 kHz, Explain frequency translation with a neat diagram, show what are the first three upper sideband and lower sideband frequencies? **08**

c) Explain how a VSB signal can be obtained from a modulating signal m(t) using a carrier $A_c\cos 2\pi f_c t$. **07**

UNIT - IV

6 a) Show that the Spectrum of FM contains infinite number of sidebands. **07**

b) Explain the generation of FM using direct and indirect method. **08**

c) A frequency-modulated voltage wave is given by the equation : **05**
$e = 12 \cos (6 \times 10^8 t + 5 \sin 1250t)$ Find (i) carrier frequency (ii) signal frequency (iii) modulation index (iv) maximum frequency deviation (v) power dissipated by the FM wave in a 10-ohm resistor.

UNIT - V

7 a) State Sampling Theorem for low pass signals? A signal $g(t)=10\text{Cos}(40\pi t)\ \text{Cos}(400\ \pi t)$ is sampled at the rate of 500 Samples/Sec. Determine the Nyquist rate, Calculate the cutoff frequency of ideal reconstruction filter. Draw the spectrum of resulting sampled signal. If g(t) is considered to be a band pass signal, determine the lowest permissible sampling rate. **10**

b) For PAM transmission of voice signal with W=3KHz. Calculate B_T if f_s =8KHz and $\tau = 0.1T_s$ **04**

c) Compare FDM with TDM. **06**

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SUPPLEMENTARY EXAM - 2023