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10EC53

Fifth Semester B.E. Degree Examination, June/July 2018
Analog Communication

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

VTU EXAMS JUNE-JULY-18 26/06/2018 13:09:05

PART – A

1 a. What is Gaussian process? Mention the properties of Gaussian process. **(06 Marks)**

b. Define mean, correlation and co-variance of random process x(t). **(06 Marks)**

c. Let x have the uniform distribution given by

$$f_x(x) = \frac{1}{2\pi} \quad 0 \le x \le 2\pi$$

$$0 \quad \text{elsewhere}$$

Calculate mean, mean square value, variance and standard deviation. **(08 Marks)**

2 a. Explain generation of an AM wave using a switching modulator with mathematical equation. **(08 Marks)**

b. The output voltage of a transmitter is given by $300(1 + 0.3 \sin 5210t) \sin (2.14 \times 10^7 t)$. This voltage is fed to a load of 500Ω resistance. Determine : i) carrier frequency ii) modulating frequency iii) total power output iv) carrier power. **(06 Marks)**

c. With the help of block diagram, explain Costas receiver, which is used for de-modulating DSB-SC singles. **(06 Marks)**

3 a. Explain the generation of SSB-SC wave using phase discrimination method with mathematical proof. **(08 Marks)**

b. Find the Hilbert transform of the pulse given below, **(06 Marks)**

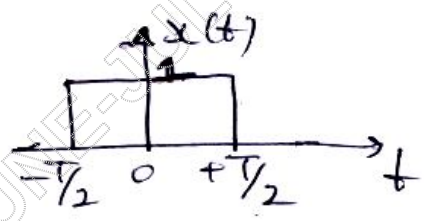

Fig.Q3(b)

c. Define Hilbert transform, pre-envelope and complex envelope. **(06 Marks)**

4 a. Show that a VSB modulated wave s(t) containing a vestiage of the lower side band is defined by $s(t) = \frac{A_c}{2} m_I(t) \cos \omega_c t - \frac{A_c}{2} m_Q(t) \sin \omega_c t$. **(06 Marks)**

b. Explain the concept of frequency translation with frequency spectrum. **(06 Marks)**

c. Give a comparison of amplitude modulation techniques. **(08 Marks)**

PART – B

5 a. Explain the generation of FM using VCO method. **(07 Marks)**

b. Find the instantaneous frequency in hertz of each of the following signals.

i) $10 \cos (200\pi t + \pi/3)$

ii) $10 \cos (20\pi t + \pi t^2)$

iii) $\cos 200\pi t \cos(5\sin 2\pi t) + \sin 200\pi t \sin (5 \sin 2\pi t)$. **(06 Marks)**

c. Compare wideband and narrowband FM systems. **(07 Marks)**

6 a. With relevant mathematical expression, explain PLL detection using non-linear model. **(07 Marks)**

b. In a broadcast super-heterodyne receiver, having no RF amplifier, the loaded 'Q' of the antenna coupling circuit is 100. If the intermediate frequency is 455KHz. Calculate the image frequency and its rejection ratio for tuning at 2000KHz. **(06 Marks)**

c. With neat block diagram discuss FM stereo multiplexing and de-multiplexing system. **(07 Marks)**

7 a. Derive the expression for noise factor of two amplifiers connected in cascade. **(08 Marks)**

b. Define and derive equivalent noise temperature with cascade connection of amplifiers. **(06 Marks)**

c. A mixer stage has a noise figure of 20dB. It is preceded by an amplifier, which has a noise figure of 9dB and an available power gain of 15dB. Calculate the overall noise figure referred to the input. **(06 Marks)**

8 a. Discuss the noise in DSB-SC receiver with a model receiver using coherent detection. Prove that the figure of merit for such a receiver is unity? **(12 Marks)**

b. Explain the concept of pre-emphasis and de-emphasis in FM system. **(08 Marks)**

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VTU EXAMS JUNE-JULY-18 26/6/2018 13:09:05