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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Fourth Semester, B.E. - Electronics and Communication Engineering

Semester End Examination; May/June - 2018

Analog Communication Theory

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. Find the Hilbert transform of the following : 6

i) $x(t) = \cos(2\Pi ft) + \sin(2\Pi ft)$ ii) $x(t) = e^{-j2\Pi ft}$

b. For the AM signal, $S(t) = m(t)\ cos(2\Pi f_c t + \phi)$

Find the following : 10

i) Pre-envelop ii) Complex envelop

iii) Natural envelop iv) In-phase and quadrature components

c. Write the spectrum of standard AM wave and explain. 4

2 a. The output of AM transmitter is given by, $400[1+0.4cos(6280t)]\ cos(3.14x10^7t)$. This voltage is fed to a load of 600 Ω resistance. Determine; 10

i) Carrier frequency ii) Modulating Frequency iii) Carrier Power iv) Total Power

b. Describe the demodulation of AM wave using square law detector. 10

UNIT - II

3 a. A message signal *m(t)* is applied to a ring modulator. The amplitude spectrum of *m(t)* has a value *M(0)* at zero frequency. Draw the spectrum of modulated signal of ring modulator output. Also find the ring modulator output at $f = \pm f_c, \pm 3f_c, \pm 5f_c$, where f_c is the fundamental frequency of the square wave carrier *C(t).* 10

b. Consider a composite wave that is obtained by adding a non-coherent carrier $A_c\ cos\ [2\pi f_c t + \phi]$ to a DSBSC wave $m(t)\ cos[2\pi f_c t]$. The composite wave is then applied to an envelope detector. Evaluate the detector output for, 10

$\phi = 0, \quad |m(t)| << \frac{A_c}{2}$.

4 a. Analyze the demodulation of SSB-SC wave using coherent detection. Also describe the coherent detector with phase error. 10

b. With neat diagram, explain FDM. 10

UNIT - III

5 a. Describe the phase discrimination method of generating VSB-SC wave. Also explain the demodulation of VSB-SC wave using envelope detection. 12

b. Write the block diagram of multiplexer in TV transmitter. Explain. 8

Contd….2

6 a. Derive the equation for narrow-band FM wave. Also draw the Phasor diagram and spectrum of NBFM wave. 10

b. A 100 MHz carrier has a peak voltage of 5 V. The carrier is frequency modulated by a sinusoidal modulating waveform of frequency 2 kHz such that the frequency deviation is 75 kHz. Write the time domain expression for the modulated carrier wave form. 6

c. Describe frequency deviation. 4

UNIT - IV

7 a. An angle modulated signal is represented by,

$S(t) = 10\cos[2\pi 10^6 t + 5\sin 2000\pi t + 10\sin 3000\pi t]$ V. Find;

i) The power in the modulated signal ii) The frequency deviation Δf 10

iii) The deviation ratio iv) The phase deviation $\Delta\theta$

v) The transmission BW

b. Describe the generation of WBFM wave using direct method. 10

8 a. Analyze the demodulation of FM wave using PLL. 12

b. Describe non-linear effect in FM Systems. 8

UNIT - V

9 a. Describe the following types of noise :

i) Extraterrestrial noise

ii) Shot noise 10

iii) Johnson noise

b. When the noise temperature at the input to a certain amplifier changes from T_0 to $2T_0$ and the output noise power increases by one third. Find noise figure F and the equivalent noise temperature T_e of the amplifier. 10

10 a. Draw the block diagram of SSB-SC receiver and show that it has unity FOM. 12

b. Describe threshold effect in FM. 8

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