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SF-7087

B. E. - III (Sem. - VI) (ECC/IC) Examination

May/June – 2011

Analog Digital Communication

Time : Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. - 3 (SEM. - 6) (ECC/IC)**

Name of the Subject :

☛ **ANALOG DIGITAL COMMUNICATION**

☛ Subject Code No. : **7 0 8 7** ☛ Section No. (1, 2,.....) : **Nil**

Seat No. :

Student's Signature

(2) Attempt all questions.

(3) Figures to the right indicate full marks.

(4) Assume suitable data whenever necessary and specify your assumptions clearly.

(5) Use of scientific non-programmable calculator CASIO Fx 82, 83, 100 or equivalent of other makes is allowed.

1 (a) Answer in brief with proper justification. **10**

(i) In FM, if amplitude of modulating signal is doubled, the practical bandwidth will be

(a) doubled

(b) half

(c) same as earlier

(d) will be 1.5 times

(ii) The Fourier transform on the unit step function is _____.

(iii) Practical bandwidth of a narrow band FM signal equals

(a) $2f_m$

(b) f_m

(c) $2\Delta f$

(d) Δf

(iv) The Fourier transform of Gaussian pulse is

(a) uniform

(b) a pair of impulses

(c) Gaussian

(d) step

(v) Two orthogonal signals $S_1(t)$ and $S_2(t)$ must satisfy the relation

(a) $\int_{-\infty}^{\infty} s_1(t)s_2(t)dt = 0$

(b) $\int_{-\infty}^{\infty} s_1(t)s_2(t)dt = 1$

(c) $\int_{-\infty}^{\infty} s_1(t)s_2(t)dt = \infty$

(d) $\int_{-\infty}^{\infty} s_1(t)s_2(t)dt = \pi$

(b) State and prove time and frequency shifting properties for Fourier transform. **5**

(c) Find the magnitude and phase spectra of signal $x(t)=e^{-at}. u(t)$ **5**

2 (a) Derive systematically equation for single tone AM wave and explain each term in it. Draw and explain frequency contents of the same. **8**

(b) Explain with necessary details square law diode modulation scheme for AM. **8**

OR

2 (a) Describe any one method of DSBSC signal generation with Necessary Circuit diagram and equations. **8**

(b) A 4000 Hz audio tone amplitude modulates a 200 kHz carrier resulting in a AM modulated signal having modulation index of 90%. Total transmitted power is 12 k Watts. **8**

Find

(i) What frequencies will appear in analysis of modulated wave ? **8**

(ii) Determine the power content of each of the frequencies that appear in spectrum analysis.

3 Attempt any **two** : 14

(a) State the general equation of FM in phasor form. Derive the expression for single tone NBFM.

(b) Explain foster seely detector method for FM demodulation.

(c) In a typical Armstrong method for FM generator, the crystal oscillator frequency is 200 kHz. The maximum phase deviation is limited to 0.2 to avoid distortion. Let f_m to be ranged from 50 Hz to 15 kHz.

The carrier frequency at output is 108 MHz. Select the multiplier and mixer oscillator frequencies. Assume N2 : N1 = 3:1.

4 (a) Answer the followings : **10**

(i) State sampling theorem for band limited signal. What is Nyquist rate ?

(ii) Draw the block diagram of FSK transmitter.

(iii) What are advantages of DM over PCM ?

(iv) What do you mean by digital multiplexing ? State its advantages.

(v) For binary data 110101 draw the line coding waveform with Bipolar RZ format.

(b) What do you mean by quantization ? Why it is required in analog to digital conversion ? Considering general input derive the expression for SQNR. **6**

(c) Explain FDM with suitable example. 4

5 (a) Draw and explain black diagram of QPSK transmitter and receiver. **7**

(b) A television signal (video and audio) has a bandwidth of 4.5 MHz. This signal is sampled, quantized, and binary coded to obtain a PCM signal. 8

(i) Determine the sampling rate if the signal is to be sampled at a rate 20% above the Nyquist rate.

(ii) If the samples are quantized into 1024 levels, determine the number of binary pulses required to encode each sample.

(iii) Determine the binary pulse rate (bits per second) of the binary-coded signal, and the minimum bandwidth required to transit this signal.

OR

5 (a) Draw and explain block diagram of digital QAM transmitter and receiver. **7**

(b) Explain the significance of Shannon's channel capacity theorem. Derive Shanon's lower bound on SNR. **8**

6 Attempt any **three** : **15**

(a) Explain the Costas loop method for carrier recovery in BPSK.

(b) Define and explain concept of entropy, information and information rate.

(c) Explain a method to obtain the Huffman code. Find the equations for average length of the code, source entropy, code efficiency and redundancy.

(d) A zero memory source emits messages m1 and m2 with probabilities 0.8 and 0.2 respectively. Find the optimum binary code for this source. Determine the code efficiency.

(e) State and explain desirable properties of various line coding formats.