SPRING END SEMESTER EXAMINATION-2019

4th Semester B.Tech & B.Tech Dual Degree

PDC

EC-2004

(For 2018(L.E) & 2017 Admitted Batches)

Time: 3 Hours | Full Marks: 50

Answer any SIX questions.
Question paper consists of four sections-A, B, C, D.
Section A is compulsory.
Attempt minimum one question each from Sections B, C, D.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.

SECTION-A

1. Answer the following questions. [1 × 10]

   (a) Find whether the signal $x(t)=5\cos(10\pi t+1) - 5\sin(4t-1)$ is periodic or not ?

   (b) What is Convolution of signal? Mention its significance.

   (c) Compare between analog communication and digital communication.

   (d) Is it possible to use envelope detector for the detection of DSB-SC and over modulated A.M? Justify.

   (e) Draw the waveform of different types of samples produced by different sampling methods.

   (f) A carrier signal $c(t)=20 \cos 2\pi 10^6 t$ is amplitude modulated by a message signal having 3 frequency components at 15kHz, 20 kHz and 25kHz.The corresponding modulation indices are 0.4,0.5 and 0.6 respectively. Sketch the spectrum and calculate the bandwidth.

(g) Explain the function of anti aliasing filter.

(h) Prove that "If the receiver knows the message being transmitted, the amount of information carried will be zero".

(i) How is entropy related to source coding?

(j) What is modem? Explain it's principle of operation.

SECTION-B

2. (a) Draw the PCM system block diagram. And explain the function of each block. [4]

   (b) Explain the coherent detection method for DSB-SC signal. And also discuss one of the errors associated with this method. [4]

3. (a) Explain the function of layers present in OSI Model. [4]

   (b) State and prove sampling theorem. Explain ALIASING with proper spectrum diagram. [4]

SECTION-C

4. (a) What are the attributes of a receiver? Discuss the operation of a super heterodyne receiver with proper figure. [4]

   (b) A 20K HZ sinusoidal signal modulates another 20 Watt sinusoidal signal results 80 Watt Amplitude modulated signal. Find sideband power and modulation index. [4]

5. (a) A Television signal having a band width of 5 MHz is transmitted using binary PCM System. Given that no of quantization levels is 1024. Determine [4]

   i. code word length

ii. final bit rate

iii. Transmission bandwidth

iv. output signal to quantization noise ratio.

(b) Compare the properties of FSK, ASK and PSK in terms of expression and waveform. [4]

6. (a) Given a Telegraph source having two symbols, Dot and Dash. The Dot duration is 0.2 sec. The Dash duration is 3 times the Dot duration. The probability of the Dot's occurring is twice that of Dash. And the time between symbols is 0.2 sec. Calculate the information rate of the telegraph source. [4]

(b) State Shannon-Hartley theorem and find the maximum capacity of a channel in presence of white gaussian noise. Also explain the trade-off between channel bandwidth and SNR using an example. [4]

SECTION-D

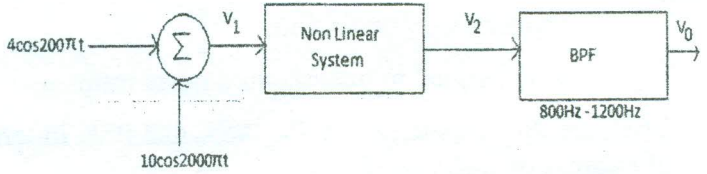
7. (a) Mention Shannon's source coding theorem. Five source messages (with their probabilities) are generated by a discrete source as $m_1(0.4)$, $m_2(0.15)$, $m_3(0.15)$, $m_4(0.15)$, $m_5(0.15)$. Find coding efficiency using Shannon-fano coding and draw the decoding tree of it. [4]

(b) 10 signals are transmitted through a channel using TDM principle. Each sample is encoded into 10 bits. The speed of commutator is 1000 revolutions per sec. Determine the bit rate of the multiplexed signal [4]

I. if synchronization requires 5 extra bits per frame.

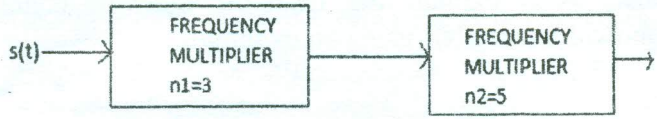
II. if synchronization requires 1 extra bit per sample.

8. (a) Consider a square law modulator shown in the fig: [4]



$v_2 = v_1 + 0.1\ v_1^2$ .The BPF is an ideal unity gain filter having passband from 800 Hz to 1200 Hz. Determine the modulation index, band width and total power of the A.M signal generated.

(b) Consider a narrow band F.M signal s(t)= 4cos [$\pi 10^6$t +0.3 sin$\pi 10^3$t] is passed through two frequency multipliers connected in series, with order n1=3 and n2=5 respectively. Determine the carrier frequency, modulation index and band width at the output of each frequency multiplier. [4]



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