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**Question Paper Code : 10293**

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2012.

Fourth Semester

Electronics and Communication Engineering

EC 2252/147402/EC 42/10144 EC 403/EC 1252/080290020 — COMMUNICATION  
THEORY

(Common to PTEC 2252 Communication Theory for B.E. (Part-Time) Third  
Semester ECE — Regulation 2009)

(Regulation 2008)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Compute the bandwidth of the Amplitude Modulated signal given by  $S(t) = 23[1 + 0.8 \cos(310t)] \cos(230000\pi t)$ .
2. What are the causes of linear distortion?
3. Illustrate the relationship between FM and PM, with block diagrams.
4. What is meant by detection? Name the methods for detecting FM signals.
5. Define a random variable. Specify the sample space and the random variable for a coin tossing experiment.
6. Give the definition of noise equivalent temperature.
7. Determine the range of tuning of a local oscillator of a Super Heterodyne receiver when  $f_{LO} > f_c$ . The broadcast frequency range is 540 Hz to 1600 Hz. Assume  $f_{IF} = 455$  kHz.
8. What is capture effect in FM?

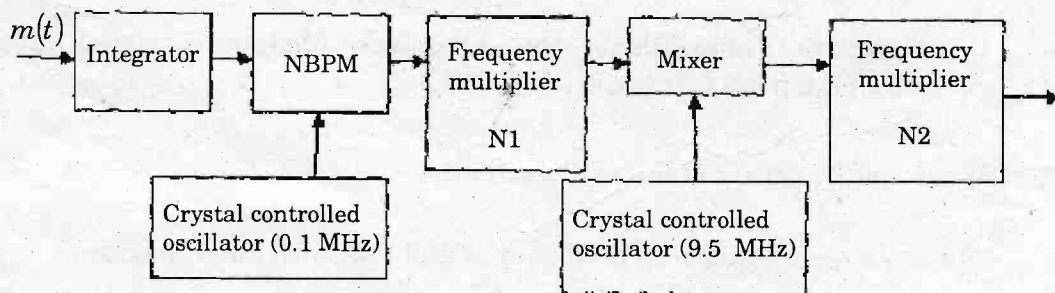
9. A source generates three messages with probability 0.5, 0.25, 0.25. Calculate source entropy.
10. State the advantages of Lempel-Ziv coding.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Draw an envelope detector circuit used for demodulation of AM and explain its operation. (10)
- (ii) How SSB can be generated using Weaver's method? Illustrate with a neat block diagram. (6)

Or

- (b) (i) What is frequency division multiplexing? Explain. (10)
- (ii) Compare various Amplitude modulation systems. (6)
12. (a) Fig. shows the block diagram of WBFM modulator used to transmit audio signals containing frequencies in the range 100 Hz to 15 kHz. The desired FM signal at the transmitter output is to have a carrier frequency of 100 MHz and a minimum frequency deviation of 75 kHz. Assume the modulation index  $\beta = 0.2$  radians for NBFM. Find the frequency multiplier values  $N_1$ ,  $N_2$  and values of carrier frequency and frequency deviation at the various points in WBFM modulator. (16)



Block Diagram of WBFM Modulator

Or

- (b) Draw the circuit diagram of a Foster-Seeley discriminator and explain its working with relevant phasor diagrams. (16)
13. (a) (i) List the different types of random process and give the definitions. (10)
- (ii) Write short notes on shot noise. (6)

Or

- (b) (i) Write the definition, power spectral density and autocorrelation function for white noise and narrow band noise (filtered white noise). (10)
- (ii) What causes thermal noise in a material? Write the expression for RMS value of the noise. (6)
14. (a) (i) Sketch the block diagram of DSB-SC/AM system and derive the figure of merit. (8)
- (ii) Using superheterodyne principle, draw the block diagram of AM radio receiver and briefly explain it. (8)

Or

- (b) Discuss the effects of noise on the carrier in a FM receiver with suitable mathematical derivations. (16)
15. (a) A Database Management System (DMS) has following alphabet with probability of occurrence as shown below.

Symbol :	$S_0$	$S_1$	$S_2$	$S_3$	$S_4$	$S_5$	$S_6$
Probability :	0.125	0.0625	0.25	0.0625	0.125	0.125	0.25

Generate the Huffman code with minimum code variance. Determine the code variance and code efficiency. (16)

Or

- (b) Derive Shannon-Hartley theorem for the channel capacity of a continuous channel having an average power limitation and perturbed by an additive band-limited white Gaussian noise. Explain the bandwidth signal-to-noise ratio tradeoff for this theorem. (16)