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Question Paper Code : 11327

B.E/B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2012.

Fourth Semester

Electronics and Communication Engineering

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

(Regulation 2008)

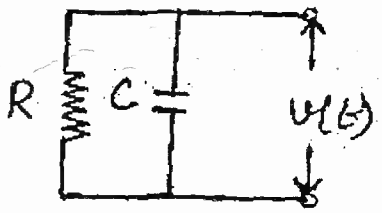
(Common to PTEC 2252 Communication Theory for B.E. (Part-Time) Third Semester ECE – Regulation 2009)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. An amplitude modulation transmitter radiates 1000 watts of unmodulated power. If the carrier is modulated simultaneously by two tones of 40% and 60% respectively, calculate the total power radiated.
2. Calculate the local oscillator frequency if incoming frequency is f_1 and translated carrier frequency is f_2.
3. How is the Narrow band FM converted into wideband FM?
4. A carrier is frequency modulated by a sinusoidal modulating frequency 2 kHz, resulting in a frequency deviation of 5 kHz. What is the bandwidth occupied by the modulated waveform?
5. Define a random variable. Specify the sample space and the random variable for a coin tossing experiment.
6. Calculate thermal noise voltage across the simple RC circuit shown with R = 1 kΩ and C = 1 μF at T = 27°C.



7. Compare the noise performance of DSBSC receiver using coherent detection with AM receiver using envelope detection.
8. Define pre-emphasis and de-emphasis.
9. State source coding theorem.
10. Define Shannon's channel coding theorem.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Define Amplitude modulation. How an amplitude modulated signal can be generated using a non-linear modulator circuit? (8)

(ii) What is a DSB-SC signal? Write the working of a synchronous detector used to detect a DSB-SC signal with the output amplitude spectrum of each block. (8)

Or

(b) (i) Discuss in detail about frequency translation and frequency division multiplexing technique with diagrams. (10)

(ii) Compare Amplitude Modulation and frequency Modulation. (6)

12. (a) (i) Derive the expression for Wide band FM in terms of Bessel functions. (10)

(ii) How can FM be derived from PM and vice versa? Explain in detail. (6)

Or

(b) Explain any two methods used for FM detection, with neat sketches. (16)

13. (a) (i) Derive the expression for shot noise voltage. (10)

(ii) Give the properties of auto correlation function. (6)

Or

(b) (i) A mixer stage has a noise figure of 20 dB and this is preceded by an amplifier that has a noise figure of 9 dB and an available power gain of 15 dB. Calculate the overall noise figure referred to the input. (8)

(ii) A receiver has a noise figure of 12 dB and it is fed by a low noise amplifier that has a gain of 50 dB and a noise temperature of 90 K. Calculate the noise temperature of the receiver and the overall noise temperature of the receiving system. Take room temperature as 290 K. (8)

14. (a) Derive an expression for SNR at input (SNR_c) and output of (SNR_o) of a coherent detector. (16)

Or

(b) (i) Derive the output SNR for FM reception. (8)

(ii) Explain the significance of pre-emphasis and de-emphasis in FM system. (8)

15. (a) (i) Consider a discrete memory less source with seven possible symbols $X_i = \{1, 2, 3, 4, 5, 6, 7\}$ with associated probability $Pr = \{0.37, 0.33, 0.16, 0.07, 0.04, 0.02, 0.01\}$. Construct the Huffman's code and determine the coding efficiency and redundancy. (10)

(ii) A Discrete memory less source emits 5 symbols whose associated probabilities are as given below. Construct Shannon Fano code and determine the efficiency. (6)

Symbols :	X0	X1	X2	X3	X4
Probabilities :	0.4	0.19	0.16	0.15	0.1

Or

(b) (i) Derive the channel capacity of a continuous band limited white Gaussian noise channel. (10)

(ii) Discuss about rate distortion theory. (6)