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Question Paper Code : 57285

B.E/B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fourth Semester

Electronics and Communication Engineering

EC 6402 – COMMUNICATION THEORY

(Regulations 2013)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. What theorem is used to calculate the average power of a periodic signal $g_p(t)$? State the theorem.
2. What is Pre envelope and complex envelope ?
3. A carrier signal is frequency modulated by a sinusoidal signal of 5 Vpp and 10 kHz. If the frequency deviation constant is 1 k Hz/V, determine the maximum frequency deviation and state whether the scheme is narrow band FM or wide band FM.
4. What is the need for pre-emphasis ?
5. State Central Limit Theorem.
6. Define Auto correlation function.
7. Give the definition of noise equivalent temperature.
8. Define capture effect in FM.
9. Define mutual information and channel capacity.
10. A Source is emitting symbols x_1, x_2 and x_3 with probabilities, respectively 0.6, 0.3 and 0.1. What is the entropy of the source ?

PART – B (5 × 16 = 80 Marks)

11. (a) Explain about Super Heterodyne Receiver with neat diagram. **(16)**

OR

(b) Derive the expression for DSB-SC AM and calculate its power & efficiency. Explain a method to generate and detect it. **(16)**

12. (a) (i) Derive an expression for a single tone FM signal with necessary diagrams and draw its frequency spectrum. **(10)**

(ii) An angle modulated wave is described by

$v(t) = 100 \cos(2 * 10^6 \pi t + 10 \cos 2000 \pi t)$. Find (i) Power of the modulating signal, (ii) Maximum frequency deviation, (iii) Band width **(6)**

OR

(b) (i) Explain the Armstrong method of FM generation. **(8)**

(ii) Draw the circuit diagram of a Foster – Seeley discriminator and explain its working with relevant phasor diagrams. **(8)**

13. (a) (i) Two random processes $X(t) = A \cos(\omega t + \theta)$ and $Y(t) = A \sin(\omega t + \theta)$ where A and ω are constants and θ is uniformly distributed random variable in $(0, 2\pi)$. Find the cross correlation function. **(8)**

(ii) Explain in detail about the transmission of a random process through a linear time invariant filter. **(8)**

OR

(b) (i) When is a random process said to be strict sense stationary (SSS), Wide sense stationary (WSS) and Ergodic process. **(8)**

(ii) Give a random process, $X(t) = A\cos(wt + \mu)$ where A and w are constants and μ is a uniform random variable. Show that X(t) is ergodic in both mean and auto correlation. **(8)**

14. (a) (i) Define Narrow band noise and explain the representation of Narrow Band Noise in terms of In-Phase and Quadrature Components. **(8)**

(ii) Explain Pre-emphasis and De-emphasis in FM. **(8)**

OR

(b) Explain the noise in DSB-SC receiver using synchronous or Coherent detection and Calculate the figure of merit for a DSB-SC system ? **(16)**

15. (a) (i) State and prove mutual information and write the properties of mutual Information. **(8)**

(ii) 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. **(8)**

OR

(b) Consider a discrete memory less source with seven possible symbols Xi = {1, 2, 3, 4, 5, 6, 7} with associated probabilities Pr = {0.37, 0.33, 0.16, 0.04, 0.02, 0.01}. Construct the Huffman's code and Shannon Fano code and determine the coding efficiency and redundancy. **(16)**
