c) Determine the noise current for a diode with 1mA dc current and the noise is measured in a bandwidth of 10MHz.

d) What are the various sources of noise, how noise affects the overall performance of a communication system.

OR

Find the overall noise figure of a three stage cascaded amplifier, each stage having a power gain 10dB and noise figure 6dB.

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Roll No .....

EC-405

B.E. IV Semester

Examination, June 2016

Analog Communication

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each question are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max. 50 words) carry 2 marks, part C (Max. 100 words) carry 3 marks, part D (Max. 400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

1. a) Are $A_0 \sin \omega_m t$ and $A_0 \cos \omega_m t$ orthogonal? When will they be orthonormal?

b) Define Parseval's theorem.

c) Explain Correlation and Autocorrelation.

d) A harmonic signal is represented as

$x(t) = 5\cos(5t + 25°) + 7\sin(15t + 35°)$ find :

i) Fundamental frequency and its period

ii) Amplitude of first to fourth harmonics

iii) Phase of first to fourth harmonics in seconds

OR

Obtain the Fourier transform of the signal given below

$x_1(t) = +1$ for $-2 < t < 0$ and

$x_2(t) = -1$ for $0 < t < 2$

2. a) What is product modulator?

   b) Give the advantages of single side band transmission.

   c) Consider the amplitude modulated signal $(A_c \cos \omega_c t + 2 \cos \omega_c \cos \omega_m t)$. What should be the minimum value of A_c for demodulating the signal using envelop detector? Give reasons.

   d) A 1.0MHz carrier is to be amplitude modulated by music signal with frequencies varying from 50Hz to 20KHz. Find out the range of frequencies of the upper and lower sidebands produced. Hence find the bandwidth of the channel required to transmit this modulated signal.

OR

A conventional AM transmitter station transmits with a modulation index of 0.9. The total power transmitted is 100kW. Find out the following:

i) Power carrier by the carrier.

ii) The fraction of the total power carrying any message.

iii) Does the total transmitted power vary with depth of modulation? Why?

iv) Calculate total transmitted power if the modulation is 100%.

3. a) What is pre-emphasis? Why is it used?

   b) How can narrow band FM be generated?

   c) What happens to the FM spectrum if the modulating frequency is changed but depth of modulation is kept fixed?

   d) Discuss the nature of distortion inherent in the Armstrong indirect FM generator.

OR

An angle modulated signal with carrier frequency $\omega_c = 2\pi \times 10^5$ is described by the equation

$$s(t) = 10\cos(\omega_c t + 5\sin 3000t + 10\sin 2000\pi t)$$

i) Find the power of the modulated signal

ii) Find the frequency deviation

iii) Find the deviation ratio

4. a) What is the main difference between high power and low power AM transmitter?

   b) In what ways does an FM receiver differ from that of an AM receiver?

   c) Superheterodyne radio receiver with an intermediate frequency of 455kHz is tuned to a station operating at 1200kHz. Find the associated image frequency.

   d) With the help of neat block diagram, explain high level AM transmitter.

OR

Draw the block diagram of FM superheterodyne radio receiver. Explain working of each block mentioning the typical frequencies at different points.

5. a) Define shot noise.

   b) Write down the classification of noise.