

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2017

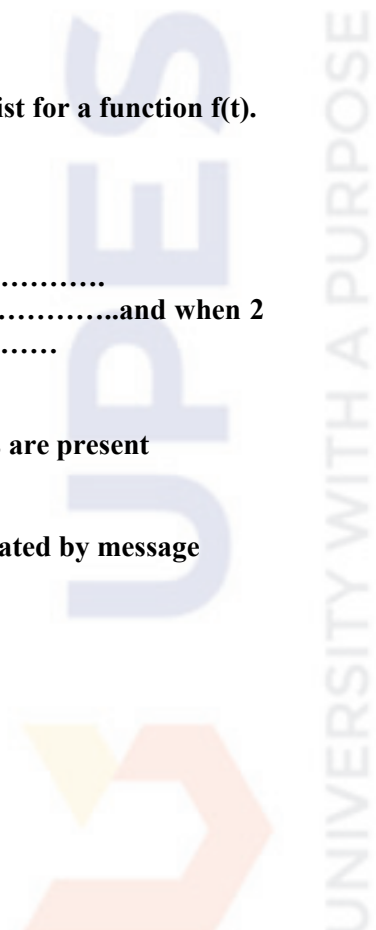
Program: B.TECH. EE
Subject (Course): ANALOG COMMUNICATION
Course Code : ELEG335
No. of page/s: 02

Semester – V
Max. Marks : 100
Duration : 3 Hrs

**NOTE: The paper contains 3 sections. It is mandatory to attend all sections.
Read the questions carefully and attempt appropriately**

SECTION-A (10 X 2 = 20 Marks)

- Q.1 Distortion occurs during channel transmission.
A. FALSE B. TRUE
- Q.2 Dirichlet's conditions must be satisfied in order to to exist for a function f(t).
- Q.3 (a) Signal to Noise Ratio =
(b) Thresholding effect is severer in than.....
- Q.4 (a) Thermal noise is a type ofgenerated noise.
(b) Atmospheric noise lies in the range of to
- Q.5 When 2 resistors are connected in series, their noise PSD can beand when 2 resistors are connected in parallel, their noise currents.....
- Q.6 Match the following:
(A) AM (P) Infinite number of sidebands are present
(B) FM (Q) Noise interference is more
(C) PM (R) Frequency Modulation
(D) FET Reactance modulator (S) Phase of the carrier is modulated by message signal
- Q.7 Write equation for Carson's rule:
.....
- Q.8 Differentiate between low level and high level AM transmitter.
- Q.9 Describe the type of modulation as depicted in below.
$$\varphi_{SSB}(t) = \frac{1}{2} [f(t) \cos \omega_c t + f_h(t) \sin \omega_c t]$$
- Q.10 Explain the advantages of Vestigial Side band modulation (VSB).
SECTION-B (4 X 10 = 40 Marks)
- Q.11 Discuss noise sources and its classification in detail.
- Q.12 Discuss the process associated with the figure 1.



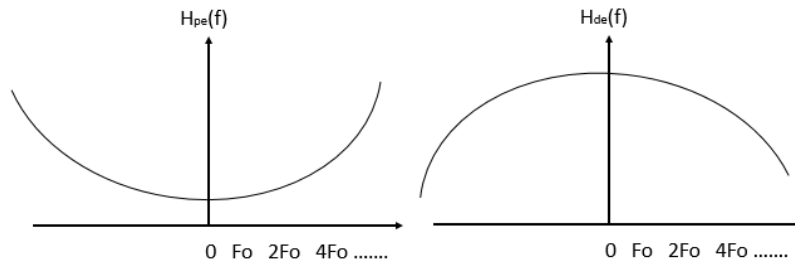


Figure 1

- Q.13 With the help of block diagram, explain the working of tuned radio frequency (TRF) AM receiver.
- Q.14 Explain following FM demodulators:
 (a) Balanced slope (b) Phase discriminator

SECTION-C (2 X 20 = 40 Marks)

- Q.15 (a) A sinusoidal carrier signal is amplitude modulated to a depth of 65% by a sinusoid, produces side frequencies of 15.025 MHz and 16.975 MHz. The amplitude of each side frequency is 170V. Find frequency and amplitude of carrier signal.
 (b) Explain the difference between phase modulation and frequency modulation by considering message signal as unit impulse signal.
- Q.16 (a) With respect to figure 2, discuss and highlight the signal processing involved.

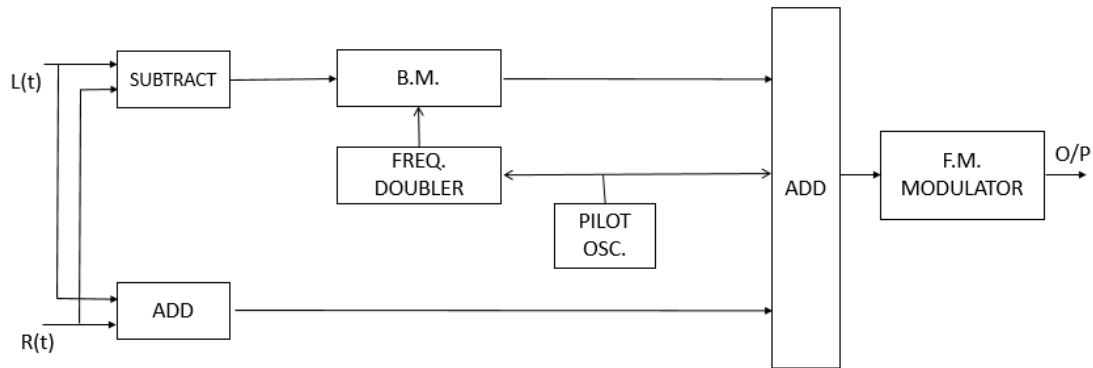


Figure 2

- (b) Prove that normalized power in Fourier expansion is:

$$S = c_0^2 + \sum_{n=1}^{\infty} \frac{C_n^2}{2}$$



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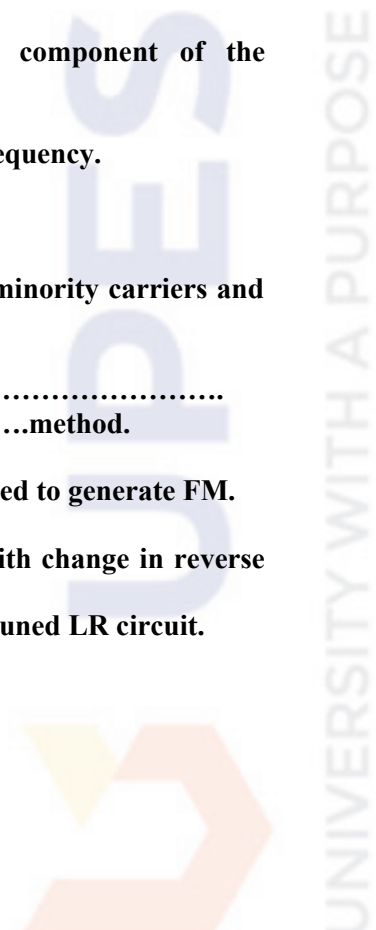
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SECTION-A (10 X 2 = 20 Marks)

- Q.1 Pre-emphasis is to boost thefrequency component of the baseband signal.
- Q.2 (a) PSD of the post detection noise varies as of the frequency.
(b) Bandwidth requirement in FM with $m > 10$ is:
(i) low (ii) medium (iii) High
- Q.3 Shot noise occurs due to inherent randomness inof minority carriers andof majority carriers.
- Q.4 (a) Mixer downconverts the incoming signal frequency to
(b) Foster Seeley method is also known asmethod.
- Q.5 In the direct method of FM generation, modulating signal is directly used to generate FM.
(a) TRUE (b) FALSE
- Q.6 (a)of a Varactor diode changes with change in reverse bias across it.
(b) In the Indirect FM generation method, Diode is in to tuned LR circuit.
- Q.7 Sensitivity of TRF receiver is very
- Q.8 For a RC LPF, prove that NEB is $B = \frac{1}{4RC}$.
- Q.9 Explain advantages and disadvantages of AM and FM.
- Q.10 Derive the following:

$$F(\omega) = \int_{-\infty}^{\infty} f(t) e^{-j\omega t} dt$$

SECTION-B (4 X 10 = 40 Marks)



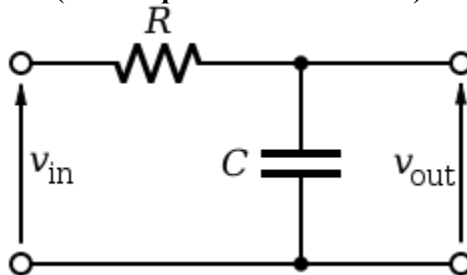
Q.11 If $f(t)$ is message signal, $x_c(t) = \cos(\omega_c t)$ is carrier signal and $f_h(t)$ is Hilbert transform of $f(t)$, prove that the time domain description of Single side band (SSB) modulation is: (CO2)

$$\frac{1}{2} [f(t) \cos(\omega_c t) \pm f_h(t) \sin(\omega_c t)]$$

Q.12 Discuss the following in detail:
 (a) FET Reactance FM modulator
 (b) Varactor diode based FM modulator

Q.13 Discuss in detail along with block diagram:
 (a) TRF AM receiver
 (b) Superhetrodyne receiver

Q.14 Derive expression for NEB (Noise equivalent bandwidth) for a simple RC LPF.



SECTION-C (2 X 20 = 40 Marks)

Q.15 (a) Prove the following for n^{th} order Bessel function:

$$J_n(m) = \frac{E_c}{2\pi} \int_{-\pi}^{\pi} e^{j(msiny - ny)} dy$$

(b) Derive the following for Normalized power in Fourier expansion.

$$S = c_0^2 + \sum_{n=1}^{\infty} \frac{c_n^2}{2}$$

Q.16 With respect to figure 1, discuss and highlight the signal and process involved after every sub blocks.

