

National Institute of Technology, Delhi

Roll No.:

Name of the Examination: B.Tech.

Branch : ECE

Semester : 4th

Title of the Course : Analog communication

Course Code : ECB253

Time: 3 Hours

Note :

Maximum Marks: 50

Guidelines:

The question paper divided into three sections A, B and C and each section have following type of questions

- Section A: Carry 10 parts of 01 marks each and all parts are compulsory.
- Section B: Contains Four (04) questions of 5 marks each.
- Section C: Contains Two (02) questions of ten (10) marks each.

Section A

- What is meant by Communication System?
- In terms of signal frequency (f_s) and intermediate frequency (f_i), the image frequency is given by
- The costas receiver is used to receive the signal
- The standard value for Intermediate frequency (IF) in AM receivers is
- Example of continuous wave analog modulation is
- Vestigial side band signals are detected by which technique.
- What is the maximum transmission efficiency of an AM signal?
- Define Cross talk.
- Draw time domain FM and PM waves.
- What is partition noise?

Section B

- If $m_h(t)$ is the Hilbert transform of $m(t)$, then show that the Hilbert transform of $m_h(t)$ is $-m(t)$.
- Define sensitivity, selectivity and fidelity for a receiver.
- A carrier is frequency modulated by $m(t) = A_m \sin \omega_m t$ with frequency modulation sensitivity constant k_f . The resulting modulation index is β_f . The same carrier is phase modulated by $m(t)$ with phase modulation sensitivity constant k_p . The resulting modulation index is β_p . Obtain the relationship between k_f and k_p so that $\beta_f = \beta_p$.
- What are the difference between PAM and PWM? Explain with suitable diagram.

Section C

- Derive an expression for the figure of merit γ when the modulating signal $f(t)$ is a single tone sinusoid given by $f(t) = m_a A \cos(\omega_m t)$, where m_a is the modulation index, and A is the carrier

amplitude and $n(t)$ is noise. Find the value of γ when the depth of modulation is: (a) 80% (b) 60% and (c) 30%.

2. A NBFM signal is generated with a carrier frequency of 100 kHz and a frequency deviation of 30 Hz is applied to a frequency multiplier chain consisting of 5 doublers and then a frequency multiplier chain consisting of 3 triplers. If the modulating signal to be a 2 kHz tone, determine the frequency deviation, modulation index and modulating frequency at the end of the doubler chain and at the end of the tripler chain.