Topic 16 Communication

Summary

- Information can be carried by different channels including wire-pairs, coaxial cables, radio waves and microwaves, and optic fibres.
- Modulation is the process whereby either the amplitude (in AM) or the frequency (in FM) of a carrier wave is varied so as to carry information.
- Bandwidth is the range of frequencies that is used in any particular broadcast.
- Bandwidth is higher for FM broadcasts, giving better sound quality.
- Information may be transmitted as an analogue signal or as a digital signal.
- A digital signal can be transmitted over a long distance without the signal becoming degraded if regenerator amplifiers are used.
- Digital communication involves analogue-to-digital conversion (ADC) on transmission and digital-to-analogue conversion (DAC) on reception.
- For good reproduction of an audio signal, the number of bits in a sample and the sampling rate need to be as high as possible.
- The ratio of two powers may be expressed logarithmically and is measured in decibels (dB): number of dB = $10 \lg (P_2/P_1)$.
- The signal attenuation, the power gain on amplification, and the signal-to-noise ratio, are all given as a ratio of two powers.
- Satellites in geostationary and in polar orbits are used for communication.

Definitions and formulae

- In amplitude modulation (AM), the carrier wave has constant frequency. The amplitude of the carrier wave is made to vary in synchrony with the displacement of the information signal.
- In frequency modulation (FM), the carrier wave has constant amplitude. The frequency of the carrier wave is made to vary in synchrony with the displacement of the information signal.
- Bandwidth is the range of frequencies occupied by the amplitude-modulated waveform.
- Signal attenuation is a loss of power.
- Power levels compared: number of decibels (dB) = $10 \lg(P_1/P_2)$