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**Part B [Thought Provoking Questions]**

**Answer all the Questions. Each question carries EIGHT marks. (5Qx8M=40M)**

11**.** Voice communications have traditionally been a very simple medium to intercept and monitor. Most voice communication systems are not designed to ensure the privacy of the conversations on them, so a new industry was created to provide solution. Design a suitable communication system which can facilitate the mention needs. (C.O.No.3) [Application]

12. Modulation depth also referred as modulation index gives the quality and strength of the transmitted signal. If the modulation index is small, the extent of variation in the carrier amplitude will be small. Accordingly the audio signal being transmitted will not be strong.Greater the depth of modulation , clearer and stronger will be the audio signal. Draw and give the condition for perfect,under and over modulation process. (C.O.No.3) [Application]

13. The receiver operates by taking the signal on the incoming frequency, mixing it with a variable frequency locally generated signal to convert it down to a frequency called as intermediate frequency, where it can pass through a high performance fixed frequency filter before being demodulated to extract the required modulation or signal. Design the receiver circuit for the process involved (C.O.No.2) [Comprehension]

14. Bluetooth is a short-range [wireless](https://en.wikipedia.org/wiki/Wireless) technology standard that is used for exchanging data between fixed and mobile devices over short distances using [UHF](https://en.wikipedia.org/wiki/Ultra_high_frequency) [radio waves](https://en.wikipedia.org/wiki/Radio_wave) in the [ISM bands](https://en.wikipedia.org/wiki/ISM_band), from 2.402 to 2.48 GHz. It is mainly used as an alternative to wire connections, to exchange files between nearby portable devices and connect [cell phones](https://en.wikipedia.org/wiki/Cell_phone) and music players with [wireless headphones](https://en.wikipedia.org/wiki/Wireless_headphone). Which type of a network is designed for sending and receiving files between cell phone and Laptop using Bluetooth technology. (C.O.No.3) [Application]

15.In a television serial, generally, a 10 minutes' serial is followed by a 5 minutes' advertisement. The time in which the serial is being broadcasted, the total frequency is dedicated to the serial. Incoming signals are divided into equal fixed-length time slots. After multiplexing, these signals are transmitted over a shared medium and reassembled into their original format after de-multiplexing. Design a suitable multiplexing technique. (C.O.No.4) [Application]

**Part C [Problem Solving Questions]**

**Answer all the Questions. Each question carries TWENTY marks. (2Qx20M=40M)**

16. a) An antenna is a system of elevated conductors which couples the transmitter or the receiver to the communication channel. Thus it required at both the ends. For proper transfer of signal (modulation) the height of the antenna should be comparable to the wavelength of the signal which is to be transferred (at least one-fourth in length).

i.Find the wavelength of antenna required to transmit a radio signal of frequency 40MHz

ii.What is the minimum height of the antenna required.

iii.Find the Bandwidth of FM radio. Given frequency band 88MHz to 108MHz

b) A modulating signal 10sin(2πx10^3t) is used to modulate the carrier signal 20sin(2πx10^3t). Determine the frequency of the carrier signal and message signal, modulation index and also the type of modulation. [10M+10M] (C.O.No.3) [Comprehension]

17. An antenna is a system of elevated conductors which couples the transmitter or the receiver to the communication channel. Thus it required at both the ends. For proper transfer of signal (modulation) the height of the antenna should be comparable to the wavelength of the signal which is to be transferred (at least one-fourth in length).

1. Find the wavelength of antenna required to transmit a radio signal of frequency 20MHz
2. What is the minimum height the antenna required.
3. Find the Bandwidth of FM radio.Given frequency band 88MHz to 108MHz

[5M+10M+5M] (C.O.No.2) [Knowledge]