Principles of Electronic Communication (313326)

MSBTE Diploma · K-Scheme · Model Question Paper — Set A

Time: 3 Hours **Max. Marks: 70**

Instructions:

1. All questions are compulsory.
2. Answer each next main question on a new page.
3. Illustrate your answers with neat sketches wherever necessary.
4. Figures to the right indicate full marks.
5. Assume suitable data, if necessary.
6. Use of non-programmable electronic pocket calculator is permissible.
7. Mobile phone, pager and any other electronic communication devices are not permissible in the examination hall.

Q.1 Attempt any FIVE of the following: **10**

a) Define half duplex and full duplex mode of communication with one example each.

b) A receiver gets a signal power of 25 mW and noise power of 0.2 mW. Calculate the signal to noise ratio in dB.

c) A 1.5 MHz carrier is amplitude modulated by an 8 kHz audio tone. Find the frequency components present in the AM wave and its bandwidth.

d) List any four types of FM detectors.

e) Define the following terms w.r.t. sky wave propagation: (i) Skip distance (ii) Critical frequency

f) Define ground wave propagation. State the frequency range for which it is used.

g) Draw a neat sketch of half wave dipole antenna and its radiation pattern.

Q.2 Attempt any THREE of the following: **12**

a) Draw the block diagram of a basic electronic communication system and describe the function of each block.

b) An 800 W carrier is amplitude modulated to a depth of 75 %. Calculate (i) total power (ii) power in each sideband (iii) transmission efficiency.

c) Compare narrow band FM and wide band FM w.r.t. (i) Modulation index (ii) Maximum deviation (iii) Bandwidth (iv) Application.

d) Name the ionospheric layer which satisfies each of the following conditions:
(i) Lowest layer; reflects VLF/LF and absorbs MF and HF to some degree.
(ii) Present in day time at about 180 km and combines with F2 layer at night.
(iii) Most important reflecting layer for HF waves; present day and night.
(iv) Aids MF surface wave and reflects some HF waves in day time.

Q.3 Attempt any THREE of the following: **12**

a) Choose the correct frequency range for the following applications: (i) Voice communication (ii) FM radio broadcasting (iii) Mobile communication (iv) Satellite communication

b) In an FM system the maximum frequency deviation is 50 kHz and the maximum modulating frequency is 15 kHz. Calculate the deviation ratio and the bandwidth using Carson's rule.

c) Identify the type of propagation used in: (i) AM (MW) radio broadcasting (ii) TV broadcasting (iii) Short wave international broadcasting (iv) GPS / satellite navigation

d) Compare resonant and non-resonant antenna on the basis of: (i) Definition (ii) Termination (iii) Reflection (iv) Radiation pattern

Q.4 Attempt any THREE of the following: **12**

a) Draw and explain the block diagram of high level AM transmitter.

b) Explain the concept of pre-emphasis and de-emphasis with circuit diagram and frequency response.

c) Compare sky wave and space wave propagation w.r.t. (i) Frequency range (ii) Effect of fading (iii) Polarization (iv) Application

d) Draw the radiation pattern of resonant dipole antennas of length (i) $L = \lambda/2$ (ii) $L = \lambda$ (iii) $L = 3\lambda/2$ (iv) $L = 2\lambda$

e) Describe the structure of a rectangular microstrip patch antenna with its radiation pattern.

Q.5 Attempt any TWO of the following: **12**

a) Define modulation index of AM. Explain the effect of modulation index on the AM wave for $m < 1$, $m = 1$ and $m > 1$ with waveforms. If the maximum and minimum amplitudes of an AM wave are 18 V and 6 V, find the modulation index.

b) List different FM detectors. Explain the working of PLL as FM demodulator with neat block diagram.

c) (i) Describe serial and parallel transmission with neat sketch.
(ii) Differentiate between synchronous and asynchronous transmission (any four points).

Q.6 Attempt any TWO of the following: **12**

a) State the principle of superheterodyne receiver. Explain the working of AM superheterodyne receiver with neat block diagram and waveforms.

b) (i) Draw the FM wave in time domain.
(ii) The equation of an FM wave is $e_{FM} = 12 \sin (6 \times 10^8 t + 5 \sin 1500 t)$.
Calculate: carrier frequency, modulating frequency, modulation index,

maximum frequency deviation, bandwidth (Carson's rule) and power dissipated in a 50 Ω resistor.

c) Write two applications of each of the following antennas: (i) Loop antenna (ii) Yagi-Uda antenna (iii) Dish antenna (iv) Horn antenna (v) Microstrip patch antenna (vi) Ferrite rod antenna

Note: This is a **model question paper prepared by Ananda Technologies** only for practice and exam preparation, based on the pattern of previous MSBTE question papers and the K-scheme syllabus. It is **not an official MSBTE paper**, and it does **not** mean that these questions will come in the exam. Answers follow standard textbook points; marks shown are indicative. Free for students — anandatechnologies.in