

AMIETE – ET (NEW SCHEME)

Time: 3 Hours

JUNE 2012

Max. Marks: 100

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

Q.1 Choose the correct or the best alternative in the following: (2×10)

- a. In AM a message signal of 5 kHz is modulated by a carrier of 100 kHz, the Bandwidth of the modulated signal is

(A) 5 kHz (B) 10 kHz
(C) 100 kHz (D) 105 kHz

- b. If the carrier of a 100 percent modulated AM wave is suppressed, the percentage power saving will be

(A) 50 (B) 150
(C) 83.33 (D) 66.66

- c. In a communication system noise is likely to affect the signal

(A) at the receiver (B) in the information source
(C) in the channel (D) at the transmitter

- d. An FM signal with a deviation δ is passed through a mixer, and it has frequency reduction fivefold. The deviation at the output of the mixer is

(A) δ (B) 5δ
(C) $\delta/5$ (D) 25δ

- e. A receiver has poor IF selectivity. It will therefore also have poor

(A) Blocking (B) Double-spotting
(C) Sensitivity (D) Diversity reception

- f. If the transmission line is properly matched, then the VSWR is

(A) 0 (B) 1
(C) Less than 1. (D) Greater than 1

- g. To couple a coaxial line to a parallel-wire line, it is best to use a
- (A) Slotted line (B) Balun
(C) Directional coupler (D) Quarter-wave transformer
- h. High frequency waves are
- (A) Absorbed by the F_2 layer (B) Reflected by the D layer
(C) Affected by the solar cycle (D) Capable of use for long distance communication
- i. Wave guide acts like a
- (A) High pass filter (B) Low pass filter
(C) Band pass filter (D) Band stop filter
- j. Indicate which modulation system is digital
- (A) Pulse Code modulation. (B) Pulse Amplitude modulation.
(C) Pulse Position modulation (D) Pulse Width modulation

**Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.**

- Q.2** a. Define modulation and explain its need in communication system. (4)
- b. Write short note on basic communication system. (4)
- c. Define noise figure and noise temperature and write the expression for the same. (8)
- Q.3** a. Explain with neat diagram AM and modulation index. (6)
- b. With neat block diagram explain the working of low level AM transmitter (6)
- c. An AM transmitter radiates 9 kW with the carrier unmodulated, and 10.125 kW when the carrier is sinusoidally modulated. Calculate the modulation index. If another sine wave corresponding to 40% modulation is transmitted simultaneously, determine the total radiated power and effective modulation index. (4)
- Q.4** a. Obtain mathematical representation of FM & PM. (6)
- b. Explain with neat block diagram the working of indirect method of FM generation. (6)
- c. An FM wave is represented by $v = 12 \sin(6 \times 10^8 t + 5 \sin 1250t)$. Find the carrier and modulating frequencies, the modulation index and maximum deviation of FM wave. Is it narrow band or wideband FM? What power this FM will dissipate in a 10 ohm resistor? (4)

- Q.5** a. Explain with neat circuit diagram the working of Balance slope FM detector. (8)
- b. With the help of a neat diagram explain the working of superhetrodyne AM receivers. (8)
- Q.6** a. What are primary and secondary constants of a transmission lines? Write the expression for the secondary constants in terms of primary constants. (6)
- b. Explain the different applications of smith chart. (4)
- c. In a transmission line the load impedance is $Z_L = (450 - j600) \Omega$ at 10 MHz, if the characteristic impedance is 300Ω , find the position and length of the single stub for matching the load. (6)
- Q.7** a. Explain the working of a Magic tee. (6)
- b. For a parallel-plane wave guide obtain the expressions for cutoff wavelength, group and phase velocity. (6)
- c. A rectangular waveguide measures (3×4.5) cm internally, and has a 9 GHz signal propagated in it. Calculate the cut-off wavelength, the guide wavelength, the group and phase velocities and the characteristic wave impedance for
(i) the $TE_{1,0}$ mode and (ii) the $TE_{1,1}$ mode. (4)
- Q.8** a. Explain different types of Pulse modulation techniques. (8)
- b. Calculate the capacity of a standard 4 kHz telephone channel with signal to noise ratio of 10 dB. (8)
- Q.9** a. Write short note on short and medium-Haul system. (8)
- b. What is multiplexing? Explain FDM technique. (8)