

AMIETE – ET (Current & New Scheme)

Time: 3 Hours

JUNE 2017

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.**

Q1. Choose the correct or the best alternative in the following: (2 × 10)

- a. For an AM signal with 100% modulation the transmitted power is _____ times the power of un-modulated carrier
- (A) Same (B) $\sqrt{2}$ times
(C) 1.5 times (D) Twice
- b. The bandwidth required for transmitting an AM modulated signal with a message signal frequency of f_m is
- (A) $2 * f_m$ (B) $(f_m)/2$
(C) f_m (D) $4 * f_m$
- c. In commercial TV transmission in India, picture and TV signals are modulated respectively as
- (A) VSB (picture) and VSB (Speech)
(B) VSB (picture) and SSB (Speech)
(C) VSB (picture) and FM (Speech)
(D) FM (picture) and VSB (Speech)
- d. In phase shift SSB modulator, the input signals to one of the product modulators are phase shifted by
- (A) 90^0 (B) 45^0
(C) 180^0 (D) 60^0
- e. The modulating frequency in FM is increased from 10 kHz to 20 kHz. The bandwidth is,
- (A) Doubled (B) Halved
(C) Increased by 20 kHz (D) Increased by 10 kHz
- f. The correct sequence of subsystems in an FM receiver is
- (A) Mixer, RF amplifier, limiter, IF amplifier, discriminator, audio amplifier.
(B) RF amplifier, mixer, IF amplifier, limiter, discriminator, audio amplifier.
(C) RF amplifier, mixer, limiter, discriminator, IF amplifier, audio amplifier.
(D) Mixer, IF amplifier, limiter, audio amplifier, discriminator.

- g. Indicate the *false* statement. The SWR on a transmission line is infinity; the line is terminated in
 (A) A short circuit (B) A complex impedance
 (C) An open circuit (D) A pure reactance
- h. The capacity of an analog communication channel with 4 kHz bandwidth and 15 dB SNR is approximately
 (A) 20,000 bps (B) 16,000 bps
 (C) 10,000 bps (D) 8,000 bps
- i. A scheme in which several channels are interleaved and then transmitted together is known as
 (A) Frequency – Division multiplexing
 (B) Time division multiplexing
 (C) A group
 (D) A super group
- j. When electromagnetic waves are propagated in a waveguide
 (A) They travel along the broader walls of the guide
 (B) They are reflected from the walls but do not travel along them
 (C) They travel through the dielectric without touching the walls
 (D) They travel along the four walls of the wave guide

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

- Q.2** a. What are the various sources of random noise and their classifications? Explain in detail the thermal noise and the parameters affecting the thermal noise. (8)
- b. What is modulation? Explain in detail the importance of the carrier in the process of modulation. (8)
- Q.3** a. Determine the AM signal and its frequency spectrum if the modulating signal is given by $m(t) = a \cos(2\pi f_m t)$ and $f_m \ll f_c$ where f_m is message signal frequency and f_c is carrier signal frequency. (8)
- b. Define Amplitude modulation and modulation index. Express the total transmit power of an AM signal, Bandwidth and modulation index of an AM signal mathematically and explain each of them. (8)
- Q.4** a. Draw the circuit diagram of varactor diode frequency modulator and explain its operation. (8)
- b. A carrier signal $A_c \cos(\omega_c t)$ is frequency modulated by a message signal $A_m \cos(\omega_m t)$. Derive expression for the modulated signal. (8)

- Q5** a. Explain the important parameters of an Amplitude Modulation receiver and describe the effect of these parameters on the performance of the receiver. (8)
- b. For an AM super heterodyne receiver that uses high side injection and has a local oscillator frequency of 1355 kHz, determine the IF carrier, Upper Side frequency, and lower side frequency for an RF envelope which is made up of a carrier and lower side frequencies of 900 kHz, 905 kHz, and 895 kHz, respectively. (8)
- Q6** a. Explain in detail the reactance properties of open and short circuited transmission lines and also explain how the reactance varies according to the length of the transmission line. (8)
- b. What is a smith chart? What are the applications of the smith chart? (8)
- Q.7** a. What are waveguides? What is the fundamental difference between propagation in waveguides and propagation in transmission lines or free space? (8)
- b. Compare waveguides and transmission lines from the point of view of frequency limitations, attenuation and power handling capacity. (8)
- Q.8** a. Explain the process of quantization with neat diagrams. (8)
- b. What is telegraphy? Describe briefly the system and machines used for transmitting and receiving it. (8)
- Q.9** a. Explain how channels are combined into groups, and groups into super-groups, and so on in FDM with necessary diagrams. (8)
- b. Explain the principles of time division multiplexing, with a neat sketch to show how the interleaving of channels takes place. (8)