Code: AE65/AE116   **Subject: ANALOG COMMUNICATIONS**

AMIETE – ET (Current & New Scheme)

Time: 3 Hours   **DECEMBER 2018**   **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. Standard frequency range of FM Radio is
(A) 98 to 118 MHz   **(B)** 108 to 128 MHz
(C) 88 to 108 MHz   **(D)** 148 to 168 MHz

b. Indicate the false statement. Modulation is used to
(A) reduce the bandwidth used
(B) separate differing transmissions
(C) ensure that intelligence may be transmitted over long distances
(D) allow the use of practicable antennas

c. Which of the following is the most reliable measurement for comparing amplifier noise characteristics?
(A) Signal to Noise ratio   **(B)** Noise factor
(C) Shot noise   **(D)** Thermal noise agitation

d. In FM system if the maximum value of deviation is 75 kHz and maximum modulating frequency is 10 kHz, the deviation ratio and bandwidth of system is
(A) 7.5 and 170 kHz   **(B)** 8.5 and 180 kHz
(C) 7 and 175 kHz   **(D)** 9 and 190 kHz

e. The saving in power in case of an SSBSC signal as compared to standard AM signal for m = 0.5 is
(A) 98.33%   **(B)** 94.4%
(C) 75%   **(D)** 100%

f. In a super heterodyne receiver
(A) the RF stage has same selectivity than IF stage
(B) the RF stage has better selectivity than IF stage
(C) the IF stage has better selectivity than RF stage
(D) None of these

g. A series resonant circuit can be simulated by
(A) an open ended λ/4 line   **(B)** short circuited λ/4 line
(C) an open ended λ/2 line   **(D)** short circuited λ/2 line

h. For a rectangular waveguide with a = 2 cm and b = 1 cm, the cut off wavelength for TE$_{10}$ mode will be
(**A**) 2 cm   (**B**) 3 cm
(**C**) 1 cm   (**D**) 4 cm

i. In multiplexing, channels are separated by unused strips of bandwidth guard bands to prevent
(**A**) Synchronization   (**B**) random motion of electrons
(**C**) overlapping   (**D**) Both (**B**) and (**C**)

j. The error probability of a PCM is
(**A**) Calculated using noise and inter symbol interference
(**B**) Gaussian noise + error component due to inter symbol interference
(**C**) Calculated using power spectral density
(**D**) All of these

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

Q.2 a. (i) Define Modulation. What are the advantages of Modulation? **(6)**
(ii) Clearly define each of the following terms:
Bandwidth, Noise figure, Noise factor, Modulation index **(1x4)**

b. An amplifier has a bandwidth of 4 MHz with 10kΩ as input resistor. Calculate the RMS noise voltage at the input of amplifier if room temperature is 25° C. **(6)**

Q.3 a. (i) A 20kW carrier wave is amplitude modulated at 80% depth of modulation by a sinusoidal modulating signal. Calculate the sideband power, total power and the transmission efficiency of the AM wave.
(ii) Define over modulation. Draw the amplitude modulation waveforms for less than 100%, with 100% modulation. **(8)**

b. (i) Justify the statement: Why SSB not used for broadcasting?
(ii) Compare SSB generation methods in tabular forms. **(2x4)**

Q.4 a. Define frequency Deviation. Derive mathematical expression for F.M. **(8)**

b. Compare FM and PM in all aspects. **(8)**

Q.5 a. Explain with neat sketches the basic building block of Tuned Radio-Frequency (TFR) Receiver. **(8)**

b. Draw and explain Amplitude limiter circuit. **(8)**

Q.6 a. (i) Describe concept of transmission line.
(ii) Explain in details about types of losses in transmission line. **(10)**

b. Write a technical note on Directional Couplers. **(6)**

Q.7 a. Explain principles of operation of cavity Resonator. **(6)**

b. Write a note on Circulator and Isolator. **(10)**

Q.8 a. Compare PAM, PWM and PPM in all aspects. **(10)**

b. Enlist and explain advantages and applications of PCM. **(6)**

Q.9 a. Make a comparison chart of Short, Medium-Haul Systems and Long-Haul Systems. **(10)**

b. Explain in details concept of Multiplexing. **(6)**