Code: AE65   Subject: ANALOG COMMUNICATIONS

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)** 5 δ
   (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

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**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 300 Ω, 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)**