Code: DE61   **Subject: ANALOG COMMUNICATIONS**

DipIETE – ET

Time: 3 Hours   **DECEMBER 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. Modulation process facilities to:

   (A) Add two signals
   (B) Carry information on radio frequency carrier
   (C) Convert one frequency to another frequency
   (D) Multiplex two signals

   b. Noise voltage is computed using following equation:

   (A) $\sqrt{KTR}$ **(B)** $KTR\Delta f$
   (C) $KT\Delta f$ **(D)** $\sqrt{KT}$

   c. If amplitude modulated carrier has a power of 8 KW with modulation index of 60% the total transmitted power will be:

   (A) 9.44KW   **(B)** 9.44W
   (C) 8.72KW   **(D)** 6.78KW

   d. The sensitivity in an FM system is $2KHz/V$, calculate the deviation if the amplitude of modulating signal is 2.4V

   (A) 1.2KHz   **(B)** 4.8KHz
   (C) 9.6KHz   **(D)** 11.52KHz

   e. A mixer is used in a

   (A) RF receiver   **(B)** FM detection
   (C) Heterodyne receiver   **(D)** AM detection

f. Standing waves are not generated when

(A) Transmission line is open circuited
(B) Transmission line is short circuited
(C) There is mismatch between transmission line and load
(D) Transmission line is matched with the load

g. A wave guide makes the EM wave propagate:

(A) Along the axis of the wave guide
(B) Along the dielectric in the wave guide
(C) Outside the walls of the wave guide
(D) By reflection effect

h. Pulse amplitude modulation:

(A) Converts analog signal into digital signal
(B) Quantizes the signal
(C) Discretizes the signal
(D) Samples the signal

i. The signal is demodulated in a FM receiver using

(A) Square law detector   **(B)** Envelope detector
(C) Multiplier   **(D)** Ratio detector

j. The primary purpose of Broadband communication is to:

(A) Increase the bandwidth   **(B)** Increase the data rate
(C) Increase the rms power   **(D)** Increase the carrier frequency

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

Q.2   a. Draw the block diagram of a communication system and explain how messages are transmitted from one place to another?   **(6)**

b. Explain how noise affects the performance of a communication system.   **(6)**

c. An amplifier has a voltage gain of 50 and input resistance of 500 ohms. The output resistance is 30000 ohms and the load resistance is 80000 ohms. In the noise model, the equivalent noise temperature is 1500 ohms. Calculate the equivalent noise temperature and noise figure. A generator feeds the input signal having output impedance 50 ohms.   **(4)**

Q.3   a. Show that Amplitude modulation generates two side bands which have the same information content.   **(4)**

b. A test tone of 1400Hz is used to amplitude modulate a carrier of 60KHz, the power at the output is 100 watts, Calculate: **(6)**
(i) Upper and lower side band frequencies
(ii) Modulation index if the power in side bands is one fourth of carrier power

c. What are the advantages and disadvantages of suppressing a side band? Explain a process of generating SSBSC. **(6)**

Q.4 a. Show that the FM modulated voltage is given by $V = A\sin(\omega_c t + m_f \sin\omega_m t)$, Calculate the bandwidth if the deviation is 75KHz and modulating frequency is 15KHz. **(6)**

b. Explain the need of pre-emphasis in FM and how it is achieved. **(6)**

c. A modulated signal is represented by $2\sin(3.14\times10^8 t + 5\sin 9.42\times10^3 t)$, identify the type of modulation and find the carrier frequency, modulating frequency and modulation index. **(4)**

Q.5 a. Distinguish between a TRF receiver and a heterodyne receiver. **(4)**

b. What is image frequency, how this can be overcome? Calculate the image frequency if the input carrier frequency is 750KHz and IF frequency is 455KHz. **(6)**

c. Draw the block diagram of a FM receiver and explain the importance of each block. **(6)**

Q.6 a. What is the need of antenna in a communication system? Calculate the beam width and gain of a parabolic antenna with a diameter of 2m and the carrier frequency is 4.5 GHz. **(8)**

b. Explain:-
(i) Radiation resistance
(ii) Directive gain
(iii) Helical antenna
(iv) Folded Dipole **(8)**

Q.7 a. Explain the need of a wave guide and find the cutoff wavelength of a parallel plane wave guide. **(8)**

b. A rectangular wave guide has dimensions of 2.5×3cm. If a wave of 10GHz propagates, calculate the cutoff wavelength, group and phase velocities. Also calculate the characteristic impedance in TE_{10} mode. **(8)**

Q.8 a. Define Pulse modulation and explain how it is different from sinusoidal carrier modulation. **(4)**

b. It is required to obtain pulse position modulation with the width of the pulse limited to 1 millisec. Suggest the scheme that will satisfy this requirement. **(6)**

c. What is the need of companding and how it is achieved in PCM? **(6)**

Q.9 a. What is the need of multiplexing? Explain how FDM helps in sending various sources of same frequency on a single carrier. **(8)**

b. Explain short and medium haul mediums of transmission and give examples for each of them. **(8)**