Code: DE61   **Subject: ANALOG COMMUNICATIONS**

DiplETE – 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. The bandwidth of speech frequency is

  (A) 50 Hz to 15,000 Hz   **(B)** 300 Hz to 3400 Hz
  (C) 20 Hz to 20,000 Hz   **(D)** 0 to 20,000 Hz

b. If a receiver has a noise figure of 1.6, then its equivalent noise temperature in Kelvin is

  (A) 174 K   **(B)** 464 K
  (C) 290 K   **(D)** 300 K

c. If a carrier of 400 W is amplitude modulated to depth of 75%, the total power in the modulated wave is

  (A) 500 W   **(B)** 486 W
  (C) 512.5 W   **(D)** 492.5 W

d. The type of sideband technique used for TV video transmission is

  (A) DSB   **(B)** SSB
  (C) ISB   **(D)** VSB

e. The significant disadvantage of FM as compared to AM is

  (A) Wider bandwidth   **(B)** Transmitter Power
  (C) Reduction in noise   **(D)** Use of limiters

f. The double spotting in a radio receiver is due to

  (A) Poor front end selectivity   **(B)** Adequate image frequency rejection
  (C) Receiver's gain   **(D)** Receiver's sensitivity

g. The value of characteristic impedance of free space is

(A) 300 Ohm   **(B)** 75 Ohm
(C) 377 Ohm   **(D)** 120 Ohm

h. Which of the following antennas is used for TV signal reception

(A) Rhombic Antenna   **(B)** Marconi Antenna
(C) Yagi Uda Antenna   **(D)** Turnstile Antenna

i. A cavity resonator can be represented by

(A) An LCR circuit   **(B)** An LC circuit
(C) Lossy Inductor   **(D)** Lossy capacitor

j. Which of following modulation is digital in nature

(A) PAM   **(B)** PWM
(C) PPM   **(D)** PCM

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

Q.2 a. Explain with a neat block diagram, the working of a communication system.

(6)

      b. Explain shot noise in amplifying devices. **(6)**

      c. An amplifier operating over the frequency range from 18 to 20 MHz has a 10 kilo ohm input resistor. Calculate the rms voltage at the input of the amplifier, if the ambient temperature is 27 degree centigrade. **(4)**

Q.3 a. Derive an expression for Amplitude Modulated wave. Draw its waveform in Time domain for 100% modulation index. **(6)**

      b. Derive an expression for the total transmitter power in the AM wave. Also obtain its efficiency. **(6)**

      c. A broadcast radio transmitter radiates 10 KW when the modulation percentage is 60 calculate the carrier power and efficiency. **(4)**

Q.4 a. Obtain the mathematical expression for a narrow band frequency modulated wave and draw the block diagram of its generations. **(8)**

      b. Explain the indirect method of generation of FM wave. **(8)**

Q.5 a. Explain, with a neat block diagram, the working of a superheterodyne AM radio receiver. **(8)**

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b. In a broadcast superheterodyne receiver having no RF amplifier, the loaded Q of the antenna coupling circuit (at the input of the mixer) is 100. If the intermediate frequency is 455 kHz, calculate the following:
(i)   the image frequency and its rejection ratio at 1000 kHz
(ii) the image frequency and its rejection ratio at 25 MHz   **(8)**

Q.6 a. Explain the following in brief: **(8)**
(i)   Resonant and non-resonant antennas.
(ii) Folded dipole antennas.

b. Define the following antenna terms:

(i)   Bandwidth
(ii)   Beamwidth
(iii) Polarization
(iv)   Directive Gain   **(8)**

Q.7 a. Explain the phenomena of sky wave propagation and describe the importance of each layer of ionosphere in day as well as in night.   **(8)**

b. A rectangular waveguide has an internal width of 3 cm and carries the dominant mode of a signal of unknown frequency. If the characteristic impedance is 500 ohm, calculate the frequency of the signal.   **(8)**

Q.8 a. State and explain the Shannon's channel capacity theorem. Calculate the capacity of a channel having infinite bandwidth.   **(8)**

b. Differentiate between all types of pulse modulation.   **(8)**

Q.9   Write short notes any **TWO** of the following: **(2×8)**

(i)   Broadband Communication
(ii)   Multiplexing Techniques
(iii) Long distance Telephony