ROLL NO. _____

Code: DE61 **Subject: ANALOG COMMUNICATIONS**

DipIETE – ET

Time: 3 Hours **JUNE 2014** **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. Thermal noise is proportional to _____

(A) $\sqrt{\beta}$ **(B)** β
(C) β^2 **(D)** β^3
Where β is bandwidth in Hz

b. In AM, the modulation envelope has a peak value double the unmodulated carrier level when modulation is _____

(A) 25 % **(B)** 33 %
(C) 50 % **(D)** 100 %

c. In Phase modulation, the modulation index is proportional to _____

(A) signal strength **(B)** carrier voltage
(C) carrier frequency **(D)** modulating frequency

d. The emphasis circuits are used for improving S/N ratio at _____

(A) lower frequency **(B)** middle frequency
(C) higher frequency **(D)** complete frequency

e. A half wave dipole used at a frequency of 300 MHz has a length of _____

(A) 10 meters **(B)** 3 meters
(C) 1 meter **(D)** 50 centimeters

f. Type of fading which causes serious distortion of modulation is _____

(A) selective fading **(B)** interference fading
(C) absorption fading **(D)** polarization fading

g. The most often used modes in circular guides are the _____

(A) TE_{11} and TE_{10} **(B)** TE_{01} and TM_{01}
(C) TE_{10} and TM_{10} **(D)** None of these

h. In PM, without any modulation, all the transmitted pulses have the same _____

(A) amplitude **(B)** width
(C) amplitude and spacing **(D)** amplitude , spacing and width

i. The pilot carrier in SSB is used for _____

(A) better noise immunity **(B)** frequency stability response
(C) lower power consumption **(D)** none of these

j. Bandwidth (ω_m) for an AM wave is _____

(A) $2\omega_m$ **(B)** ω_m
(C) $\frac{\omega_m}{2}$ **(D)** $4\,\omega_m$

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

Q.2 a. What is modulation? Explain the need of it. **(6)**

b. Determine
(i) Noise figure for an equivalent noise temperature of 75 K.
(ii) Equivalent noise temperature for a noise figure of 6dB.
Use 290K for reference temperature. **(6)**

c. What is the bandwidth of a modulated signal? Why is it a significant factor? **(4)**

Q.3 a. Compare various amplitude modulation system on the basis of practical merits. **(6)**

b. The a.c. r.m.s. antenna current of an AM transmitter is 6.2 A when unmodulated and rises to 6.7 A when modulated. Calculate the percentage of modulation. **(6)**

c. Describe independent side band (ISB) system in brief. **(4)**

Q.4 a. Explain the operation of stabilized reactance modulator used for FM generation with the help of a neat block diagram. **(8)**

b. An Armstrong transmitter is to be used for transmission at 152 MHz in the VHF band with the maximum deviation of 15 kHz at a minimum audio frequency of 100 Hz. The primary oscillator is to be at 100 kHz and the initial phase modulation deviation is to be kept to less than 12^0, to avoid audio distortion. Find (i) the amount by which the frequency must be multiplied to

give proper deviation and (ii) specify the combination of doublers and triplers, mixers crystal and any multiplier stages needed. **(8)**

Q.5 a. With the help of a neat block diagram, explain the functioning of a broadcast FM receiver. **(8)**

b. The Pre-emphasis and De-emphasis used in other part of world are not necessarily 75 μs. Suppose that a 50 μs time constant is used, what is the necessary of -3db frequency? What resistance value can be used if the capacitor of the 75 μs pre-emphasis in the system is retained? Draw the RC circuit for Pre-emphasis and De-emphasis. **(8)**

Q.6 a. How do directors and reflector affect the radiation pattern of an antenna structure? **(7)**

b. Design a Marconi antenna for a frequency of 3 MHz: **(5)**

c. What is directivity? What factors affect the directional pattern of antenna? **(4)**

Q.7 a. Explain "skip-distance" and "skip-zone" with the help of suitable diagram. **(7)**

b. Justify that a TEM wave cannot propagate in a single conductor hollow waveguide. **(5)**

c. A rectangular waveguide is 1cm x 2cm in dimensions. Calculate λ_c for TE_{10} and TM_{11} modes. **(4)**

Q.8 a. Explain the sampling theorem for band pass signal. **(8)**

b. A signal having bandwidth of 4.2 MHZ is transmitted using binary PCM system and the number of quantization levels is 512. Determine:
(i) code word length
(ii) transmission bandwidth
(iii) final bit rate **(8)**

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

(i) flat top sampling
(ii) channel translating equipment
(iii) satellite communication