Code: AE65   **Subject: ANALOG COMMUNICATIONS**

AMIETE – ET (NEW SCHEME)

Time: 3 Hours   **DECEMBER 2011**   Max. Marks: 100

NOTE: There are 9 Questions in all.

- **Please write your Roll No. at the space provided on each page immediately after receiving the Question Paper.**
- **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. A modulated signal is a

   (A) Low pass signal   (B) band pass signal
   (C) Band rejection signal   (D) High pass signal

b. The noise power in a communication system is

   (A) Independent of bandwidth
   (B) Directly proportional to bandwidth
   (C) Inversely proportional to bandwidth
   (D) Square root of bandwidth

c. If the transmitted power is 1 kW, the maximum side band power in AM will be

   (A) 0.66 kW   (B) 1.50 kW
   (C) 0.33 kW   (D) 0.24 kW

d. Narrowband frequency modulation bandwidth is calculated using Carson's rule and is

   (A) +/− Δf (B) 2(Δf +fm)
   (C) Δf /fm   (D) (Δf +2fm)

e. An AM receiver is always a

   (A) Pulse width modulated receiver (B) Heterodyne receiver
   (C) Radio frequency receiver   (D) Superdyne receiver

f. Broadcast receiver AGC helps in maintaining the

   (A) Gain constant   (B) Local oscillator frequency constant
   (C) Volume constant   (D) I.F. frequency constant

g. An open circuit transmission line acts as

(A) Short circuit at $\lambda/2$　　　　(B) short circuit at $\lambda/4$
(C) Open circuit at $\lambda/2$　　　　(D) Open circuit at $\lambda/4$

h. The path loss is

(A) Proportional to the carrier frequency
(B) Inversely proportional to the carrier frequency
(C) Proportional to the square of carrier frequency
(D) Proportional to square root of carrier frequency

i. Pulse width modulation is for

(A) Digital signals　　　　　　(B) Analog signals
(C) Bit streams　　　　　　　(D) Acts as an interface between analog and digital

j. The most common modulation system used for telegraphy is

(A) Frequency shift keying　　　(B) Two tone modulation
(C) Pulse code modulation　　　(D) Single tone modulation

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

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

　　　b.　What are external and internal noises? How internal system noise can be
　　　　　arrived at?　　　**(6)**

　　　c.　Calculate the system noise of a receiver that has a bandwidth of 6 MHz and an
　　　　　input noise temperature of $25\,^{\circ}$ K to the antenna. The equivalent noise
　　　　　resistance of receiver is 75 ohms. The antenna has a resistance of 72 ohms.
　　　　　Assume T_o=290 $^{\circ}$ K.　　　**(4)**

Q.3　a.　If several sinusoidal waves modulate a carrier and produce corresponding
　　　　　powers, how will you arrive at average modulation index?　　　**(6)**

　　　b.　What is the need of AMSSB? Calculate the power transmitted in AMSSB if the
　　　　　modulation index is 60% if the carrier power was 500 watts. If in the same case
　　　　　AMDSB were used what would have been the power?　　　**(4)**

　　　c.　What is the application of ISB, how it is achieved? Explain using a typical ISB
　　　　　scheme.　　　**(6)**

Q.4 a. In an FM system if modulation index is doubled and modulating frequency is reduced four times, what is the effect on the frequency deviation? **(4)**

b. Explain using phasor diagram the effect of noise on frequency modulation **(6)**

c. Explain the principle of basic reactance modulator. **(6)**

Q.5 a. What are the advantages of a super heterodyne receiver over tuned RF receiver? **(8)**

b. What is image frequency and how it can be rejected? If the IF is 400 kHz and the input frequency is 565 kHz what will be the image frequency? Will this interfere in the 555 kHz to 1650 kHz spectrum? **(8)**

Q.6 a. Define characteristic impedance of a transmission line, what are the factors on which this impedance depends? **(4)**

b. Use smith chart to determine the position and length of a short circuited stub. The load impedance is (320–j270) at 5 MHz, the transmission line has an characteristic impedance of 150 ohms. **(6)**

c. Briefly explain the importance of
(i) Double stub   (ii) Balun **(6)**

Q.7 a. What is the need of Wave guides at microwave frequencies? Define cut-off frequency, comment whether a wave of frequency 12 GHz will propagate or not in a TE_{10} mode in a rectangular waveguide with a = 3 cm and b = 2.5 cm in case of m=1, 2, 3and 4 respectively.

(8)

b. Explain the principle and applications of
(i) Coupler   (ii) Cavity resonator **(8)**

Q.8 a. How capacity of a noise channel can be determined? **(4)**

b. What is need of Pulse modulation? Explain the various methods used for pulse modulation. **(8)**

c. What is meant by companding, why it is necessary? **(4)**

Q.9 Write short notes on:

(i)   Time-division multiplexing
(ii) Long-Haul system
(iii) Satellite communication
(iv) Losses in optical fibre **(16)**