

Code: DE61

Subject: ANALOG COMMUNICATIONS

DiplETE – ET

Time: 3 Hours

JUNE 2013

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. Shot noise current  $i_N$  in diode is proportional to \_\_\_\_\_

- (A)  $\sqrt{i_P}$  (B)  $i_P$   
 (C)  $(i_P)^2$  (D)  $\frac{1}{i_P}$

Here  $i_p$  is the dc diode current.

b. If  $P_C$  is the power of the un-modulated signal and  $m$  is the modulation index thus the power carried by each side band is \_\_\_\_\_

- (A)  $\frac{m^2 P_C}{8}$  (B)  $m P_C$   
 (C)  $\frac{m P_C^2}{4}$  (D)  $\frac{m^2 P_C}{4}$

c. The purpose of a balanced modulator circuit is to eliminate \_\_\_\_\_

- (A) lower side band (B) carrier  
 (C) upper side band (D) base band signal

d. In FM, if  $f_m$  is the modulating frequency, then the modulation index is proportional to \_\_\_\_\_

- (A)  $f_m$  (B)  $f_m^2$   
 (C)  $\frac{1}{f_m}$  (D)  $\frac{1}{f_m^2}$

**Code: DE61****Subject: ANALOG COMMUNICATIONS**

- e. In a radio receiver AGC voltage is proportional to
- (A) the amplitude of IF carrier      (B) the amplitude of audio signal  
(C) the amplitude of power supply      (D) all of these
- f. Which of the following antenna is commonly used for microwave link?
- (A) Loop antenna      (B) Parabolic dish  
(C) Rhombic antenna      (D) Dipole antenna
- g. Frequencies in the UHF range propagate by means of \_\_\_\_\_
- (A) Sky waves      (B) surface waves  
(C) Space waves      (D) None of these
- h. Waveguides are very efficient in the frequency range \_\_\_\_\_
- (A) 3 Hz -300 Hz      (B) 3 MHz-300 MHz  
(C) 3GHz-300 GHz      (D) 20 Hz-20 KHz
- i. The most common modulation system used for telegraphy is
- (A) PCM      (B) two-tone modulation  
(C) single-tone modulation      (D) FSK
- j. In order to separate channels in a TDM receiver, it is necessary to use \_\_\_\_\_
- (A) AND gates      (B) Band pass filter  
(C) Differentiator circuits      (D) Integrator circuits

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

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- Q.2** a. What is modulation? Explain the need of modulation and draw the block diagram of basic communication system. (6)
- b. A receiver connected to an antenna whose resistance is  $75 \Omega$  has an equivalent noise resistance of  $25 \Omega$ . Calculate the receiver noise figure in decibels and its equivalent noise temperature. (6)
- c. List different types of internal and external noise. (4)
- Q.3** a. Draw the block diagram of AM transmitter and explain its working. (8)
- b. With the help of a block diagram, explain the working of phase shift method used for generating SSB signal. (8)

Code: DE61

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- Q.4** a. In an FM system, when the audio frequency (AF) is 400 Hz and audio frequency voltage is 2 Volts, the deviation is 4 KHz. If the AF voltage is now increased to 7 Volts, what is the new deviation? If AF is raised to 10 Volts while the AF is dropped to 200 Hz, what is the deviation? Find the FM modulation index in each case. (8)
- b. Draw block diagram of Armstrong frequency modulator system and describe its working. (8)
- Q.5** a. Discuss the following term related to Radio Receiver:  
(i) Selectivity (ii) Sensitivity  
(iii) Image frequency (iv) Double spotting (8)
- b. Describe the operation of stereo FM multiplex demodulator with the help of block diagram? (8)
- Q.6** a. An antenna has a radiation resistance of  $72 \Omega$ , loss resistance of  $8\Omega$  and a power gain of 20. Find:  
(i) Antenna efficiency  
(ii) Antenna gain (Power actually radiate) (4+4)
- b. Explain the functioning of the following:  
(i) End fire array  
(ii) Broad side array (4+4)
- Q.7** a. Explain following terms in connection with sky wave propagation.  
(i) Virtual Height  
(ii) Critical frequency  
(iii) Maximum Usable Frequency  
(iv) Skip distance (2+2+2+2)
- b. A rectangular waveguide whose breadth is 5 cm internally and has a 6 GHz signal propagate in it. Calculate the cut-off wavelength, the guide wavelength, group velocity, and phase velocity for the  $TE_{1,0}$  mode. (8)
- Q.8** a. Compare PAM, PWM and PPM. (6)
- b. Explain information theory and capacity of noisy channel. Discuss the unit of information. (6)
- c. What is telegraphy? Describe briefly (4)
- Q.9** Write short note on the following (any **TWO**) (2×8)
- (i) Satellite communication.  
(ii) Microwave link- simplified block diagram and working principle.  
(iii) Frequency Division Multiplexing