

**AMIETE – ET (Current & New Scheme)**

Time: 3 Hours

**JUNE 2016**

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 cavity magnetron use strapping to  
(A) prevent mode jumping (B) prevent cathode back heating  
(C) ensure bunching (D) improve the phase focusing
- b. If the height of transmission towers is increased, which of the following parameters is likely to change?  
(A) Resistance (B) Inductance  
(C) Capacitance (D) None of these
- c. In PCM, the quantization noise depends on  
(A) Sampling rate (B) number of quantization levels  
(C) Signal power (D) none of these
- d. An AM broadcast radio transfer radiates 10k watts of power if modulation percentage is 60. Calculate how much is the carrier power.  
(A) 8 (B) 8.25  
(C) 8.47 (D) 8.75
- e. A 107.6 MHz carrier signal is frequency modulated by a 7 kHz sine wave. The resultant FM signal has a frequency deviation of 50 kHz. Determine the modulation index of the FM wave.  
(A) 8 (B) 7  
(C) 10 (D) 9
- f. When em wave are propagated in a waveguide  
(A) they travel along the broader walls of the guide  
(B) they reflect from the wall but do not travel along them  
(C) they travel through the dielectric without touching the wall  
(D) they travel along all 4 walls of the waveguide
- g. A PAM signal can be detected by using  
(A) ADC (B) integrator  
(C) BPF (D) HPF

- h. Indicate the false statement. The square of the thermal noise voltage generated by a resistor is proportional to  
 (A) Its resistance (B) Its temperature  
 (C) Boltzmann's constant (D) The bandwidth over which it is measured
- i. For transmission-line load matching over a range of frequencies, it is best to use a  
 (A) balun (B) broadband directional coupler  
 (C) double stub (D) single stub of adjustable position
- j. What is the primary function of multiplexing?  
 (A) To allow a number of signals to make use of a single communications channel  
 (B) To match the frequency range of a signal to a particular channel.  
 (C) To select one radio channel from a wide range of transmitted channels.  
 (D) To reduce the bandwidth of a signal.

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

- Q.2** a. An AM signal is generated by modulating the carrier of frequency  $f_c = 800$  kHz by the message signal  $m(t) = \sin 2000 \pi t + 5 \cos 4000 \pi t$ . The AM wave is  $s(t) = 100 [1+m(t)] \cos 2 \pi f_c t$   
 (i) Determine the spectrum of the AM signal.  
 (ii) Determine the average power in the carrier and in the side bands. (5)
- b. Explain the Errors in coherent detection of DSB-SC. (5)
- c. Figure 1 shows a scheme for coherent demodulation. Show that this scheme can demodulate the AM signal  $[A_c + m(t)] \cos 2\pi f_c t$  regardless of the value of  $A_c$ . (6)

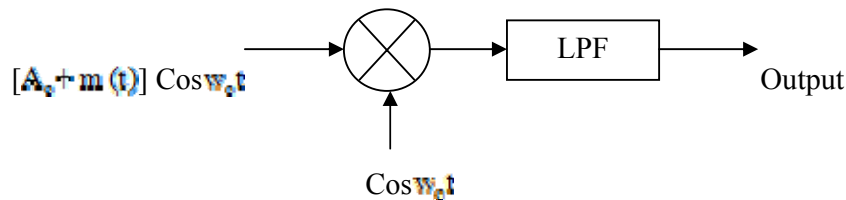


Figure 1

- Q.3** a. Show that the noise figure of SSB-SC is constant when noise analysis is performed using noisy model of SSB-SC. (8)
- b. Discuss the significance of the following terms with reference to noise:  
 (i) Noise triangle.  
 (ii) Extraterrestrial noise.  
 (iii) Pre emphasis and de- emphasis.  
 (iv) Quadrature reparation of noise. (4x2 = 8)
- Q.4** a. What are the major drawbacks of direct method of FM generation? Discuss the Armstrong method of FM generation. (8)
- b. A single tone FM is represented by the voltage equation as:  
 $v(t) = 12 \cos (6\pi \times 10^8 t + 5 \sin 125t)$  Determine:  
 (i) The modulation index.  
 (ii) Modulation frequency. (8)

- Q.5** a. A message signal band limited to 5 kHz is sampled at the minimum rate as dictated by the sampling theorem. The samples are quantized and encoded into six binary bits. Calculate the bit transmission rate and the maximum signal to quantization noise ratio. (6)
- b. Why we use Delta modulation in digital Pulse modulation instead of PCM? (5)
- c. Discuss the major drawback of delta modulation. (5)
- Q.6** a. What is tee junction in microwave devices? Obtain the scattering matrix for magic Tee. (8)
- b. An air filled waveguide with a cross-section  $2 \times 1$  cm as shown in figure 2 transports energy in the  $TE_{10}$  mode at the rate of 0.5 hp. The impressed frequency is 30 GHz. What is the peak value of electric field occurring in the waveguide? (8)

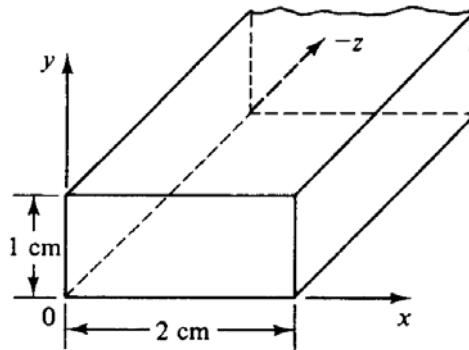


Figure 2

- Q.7** a. What are the major draw backs of TRF receiver? Explain the superhetrodyne receiver using neat sketch. (8)
- b. In a super heterodyne receiver having no RF amplifier, the loaded Q of the antenna coupling circuit (at the input of the mixture) is 90. If the intermediate frequency is 455 kHz calculate:
- Image frequency and image rejection ratio at 950 kHz
  - The image frequency and its rejection ratio at 10MHz. (8)
- Q.8** a. What is multiplexing? Explain the FDM and TDM in details. (8)
- b. Discuss the following transmission media in detail:
- |                                |                     |
|--------------------------------|---------------------|
| (i) Twisted pair cable         | (ii) Coaxial cable  |
| (iii) Multi core optical fiber | (iv) Microwave link |
- (8)
- Q.9** a. What is impedance matching? Explain stub matching in detail. (8)
- b. Write a short note on smith chart. (4)
- c. Discuss the directional coupler in brief. (4)