

Time: 3 Hours

DECEMBER 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. Amplitude modulation is the process of
- (A) superimposing a low frequency on a high frequency
 - (B) superimposing a high frequency on a low frequency
 - (C) carrier interruption
 - (D) frequency shift and phase shift
- b. Amplitude Modulation index is
- (A) V_m/V_c
 - (B) V_c/V_m
 - (C) V_m/I_c
 - (D) None of these
- c. If the carrier of 100 percent modulated AM wave is suppressed the percentage power saving will be
- (A) 50
 - (B) 150
 - (C) 100
 - (D) 66.66
- d. Transmission line is distortion less if
- (A) $LC = RG$
 - (B) $RL = GC$
 - (C) $LG = RC$
 - (D) $RLG = C$
- e. Vestigial sideband modulation (C3F) is normally used for
- (A) HF point to point communication
 - (B) Monoaural broadcasting
 - (C) TV broadcasting
 - (D) Stereo broadcasting
- f. When the modulating frequency is doubled, the modulation index is halved and the modulating voltage remains constant. The modulation system is _____.
- (A) Amplitude modulation
 - (B) Phase modulation
 - (C) Frequency modulation
 - (D) None of these

- g. A superhetrodyne receiver with IF of 450kHz is tuned to a signal at 1200kHz. The image frequency is
(A) 750kHz (B) 900kHz
(C) 1650kHz (D) 2100kHz
- h. To couple a coaxial line to a parallel wire line it is best to use
(A) Slotted line (B) Balun
(C) Directional coupler (D) Quarter-wave transformer
- i. A choke flange may be used to couple two waveguides
(A) to help in alignment of the waveguide
(B) because it is simpler than any other join
(C) for the shallow shore ends of cable
(D) to prevent insulation breakdown from the high feed voltages
- j. Armored submarine cable is used
(A) to protect the cable at great depths
(B) to prevent inadvertent ploughing-in of the cable
(C) for the shallow shore ends of cable
(D) to prevent insulation breakdown from the high feed voltages

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

- Q.2** a. Explain the need of modulation. (4)
- b. What is noise temperature? How is it related to noise figure? (4)
- c. The first stage of a two-stage amplifier has a voltage gain of 10, a 600Ω input resistor, a 1600Ω equivalent noise resistance and a $27k\Omega$ output resistor. For the second stage, these values are 25, $81k\Omega$, $10k\Omega$ and 1 megaohm($1M\Omega$), respectively. Calculate the equivalent input noise resistance of two stage amplifier. (8)
- Q.3** a. The antenna current of an AM transmitter is 8A when only the carrier is sent but it increases to 8.93A when the carrier is modulated by single sinusoidal wave. Find % of modulation and antenna current when percentage of modulation is 80%. (6)
- b. Explain the phase-shift method of SSB generation with the help of neat block diagram. (6)
- c. A certain transmitter radiates 9kW with the carrier unmodulated, and 10.125kW when the carrier is sinusoidally modulated. Calculate the modulation index, percent of modulation. If another sine wave, corresponding to 40 percent modulation, is transmitted simultaneously, determine the total radiated power. (4)

- Q.4** a. Explain the difference between frequency and phase modulation and also obtain its expression and explain the modulation index in each case. (6)
- b. What is pre-emphasis and de-emphasis? Why is it used? (6)
- c. In a PM system, when the Audio Frequency(AF) is 500 Hz and the AF voltage is 2.4 V, the deviation is 4.8 kHz. If the AF voltage is further raised to 10 V while the AF is dropped to 200 Hz, what is deviation? Find the modulation index in each case. (4)
- Q.5** a. Discuss the advantages of superhetrodyne receiver over the TRF receiver. Explain, how the constant intermediate frequency is achieved in the superhetrodyne receiver? (8)
- b. Draw and explain the working of ratio detector. Also explain, how it differ from Foster-Seelay? (8)
- Q.6** a. Define and explain the meaning of the term standing wave ratio (SWR). What is the formula for it if the load is purely resistive? Why is a low value of SWR often desirable? (6)
- b. Define directivity and directional coupling as used with directional couplers and explain their significance. (6)
- c. Write a short note on smith chart. (4)
- Q.7** a. Compare waveguides and transmission lines from the point of view of frequency limitations, attenuation, spurious radiation and power handling capacity. (8)
- b. It is necessary to propagate a 10-GHz signal in a waveguide whose wall separation is 6cm. What is the greatest number of half-waves of electric intensity which it will be possible to establish between the two walls (largest value of m)? Calculate the guide wavelength for this mode of propagation. (8)
- Q.8** a. What is pulse width modulation? How is it demodulated? (6)
- b. What is companding? Why is it used? Why is it preferable to quantizing with tapered steps? Illustrate with typical companding curves. (6)
- c. What are the advantages and application of pulse code modulation? (4)
- Q.9** a. Explain the principles of time-division multiplexing, with a sketch to show how the interleaving of channels take place? (8)
- b. Compare the salient operating methods of submarine cables with those of land based coaxial cables. What are the reasons for some of the differences? (8)