

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. The acoustic channel is used for which of the following
- (A) UHF communication
(B) SSB communication
(C) Television communication
(D) Person to person voice communication
- b. The value of a resistor creating thermal noise is doubled. The noise power generated will be
- (A) halved
(B) quadrupled
(C) doubled
(D) can't decided from given data
- c. SSB is a building block in
- (A) Time Division Multiplexing
(B) Frequency Division Multiplexing
(C) Pulse Division Multiplexing
(D) Both (A) and (B)
- d. A broadcast radio transmitter radiates 10 kW when the modulation percentage is 60. How much of this is a carrier power?
- (A) 8.47 kW
(B) 6 kW
(C) 1.66 kW
(D) 600 kW
- e. A pre-emphasis circuit provides extra noise immunity by
- (A) boosting the base frequencies
(B) amplifying the higher audio frequencies
(C) preamplifying the whole audio band
(D) converting the phase modulation to FM

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f. A receiver has poor IF selectivity. It will therefore also have poor

- (A) blocking (B) double-spotting
(C) diversity reception (D) sensitivity

g. Smith chart is also known as

- (A) transmission line (B) stub tuning
(C) circle diagram (D) Polar impedance diagram

h. Wave guide is preferred for frequencies

- (A) $> 3\text{GHz}$ (B) $< 1\text{GHz}$
(C) 100 MHz (D) 10 MHz

i. 1 dit = _____

- (A) 2 bits (B) 8 bits
(C) 3.32 bits (D) 16 bits

j. Erlang is

- (A) used to measure traffic (B) dimensionless
(C) both (A) & (B) (D) none of these

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

Q.2 a. Define Modulation. State need of modulation. (4)

b. A receiver connected to an antenna whose resistance is $50\ \Omega$ has an equivalent noise resistance of $30\ \Omega$. Calculate the receiver's noise figure in dB and its equivalent noise temperature (4)

c. Discuss addition of noise due to several amplifiers connected in cascade. (8)

Q.3 a. An audio signal given as $15\sin 2\pi(1500t)$ amplitude modulates a carrier given as $60\sin 2\pi(100000t)$:

- (i) Construct the modulated wave.
(ii) Determine the modulation index and percentage of modulation. (2×4)

b. Discuss the phase shift method to suppress unwanted sideband. (8)

Q.4 a. Why FM is called constant bandwidth system? (4)

b. Describe basic reactance modulator used to generate FM signal. (8)

c. A 25 MHz carrier is modulated by a 40 Hz audio sine wave. If the carrier voltage is 4V and the maximum deviation is 10 kHz, write the equation of this modulated wave for (i) FM and (ii) PM. (4)

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- Q.5** a. Explain the tuning process with a suitable example. (4)
- b. State requirements of a SSB receiver. (4)
- c. Discuss the operation of the balanced slope detector, using a circuit diagram and response characteristic. (8)
- Q.6** a. Draw the following for a transmission line the
(i) General equivalent circuit
(ii) RF equivalent circuit
(iii) Infinite line (6)
- b. A piece of a coaxial cable has a 75Ω characteristic impedance and a nominal capacitance of 69 pF/m . What is the inductance per meter? If the diameter of the inner conductor is 0.584 mm and the dielectric constant of the insulation is 2.23 , what is the outer conductor diameter? (6)
- c. Explain Baluns as a Transmission line component. (4)
- Q.7** a. A wave guide is propagated in a parallel – plane wave guide. The frequency is 6 GHz and the plane separation is 3 cm . Calculate :
(i) The cut-off wavelength for the dominant mode
(ii) The wavelength in a waveguide in the dominant mode
(iii) The corresponding group velocity
(iv) The corresponding phase velocity (2×4)
- b. Describe following wave guide components: (4×2)
(i) Directional coupler
(ii) Two hole coupler
- Q.8** a. Why companding is used in Pulse Code Modulation? (4)
- b. Calculate the information carrying capacity of a standard 4 KHz telephone channel and a signal to noise ratio 28-dB at the input to the receiver. (4)
- c. Discuss principle of PCM in detail. (8)
- Q.9** a. What is multiplexing? Differentiate the two types of multiplexing. (8)
- b. Define the following: (2×4)
(i) Echo suppressors
(ii) Echo cancellers
(iii) International gateways
(iv) Grade of service