
DipIETE – ET (NEW SCHEME) – Code: DE61

Subject: ANALOG COMMUNICATIONS

Time: 3 Hours

DECEMBER 2010

Max. Marks: 100

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 half an hour 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. Thermal Noise is independent of _____

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|----------------------|-------------------------|
| (A) Bandwidth | (B) Temperature |
| (C) Centre Frequency | (D) Boltzman's Constant |

b. Both Frequency and Phase Modulation are together called as _____

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|--------------------------|----------------------|
| (A) Amplitude modulation | (B) Phase modulation |
| (C) Angle modulation | (D) Duty Cycle |

c. High frequency range is _____

- | | |
|----------------------|----------------------|
| (A) 30 MHz – 300 MHz | (B) 3 MHz – 30 MHz |
| (C) Above 300 MHz | (D) 30 KHz – 300 KHz |

d. A Superheterodyne Receiver with an IF of 450 KHz is tuned to a signal at 1100KHz. The Image Frequency would be _____

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|--------------|-------------|
| (A) 2000 KHz | (B) 650 KHz |
| (C) 1550 KHz | (D) 900 KHz |

e. Impedance of Dipole Antenna is about _____

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|-------------|--------------|
| (A) 50 ohms | (B) 73 ohms |
| (C) 93 ohms | (D) 300 ohms |

f. In Amplitude Modulation for 100% modulation, the total sideband Power is _____ % of carrier power.

- | | |
|----------|----------|
| (A) 25% | (B) 50% |
| (C) 100% | (D) 150% |

For first stage Voltage Gain of Amplifier 1 (A_1)= 15, Input Resistor = 500 ohms, Equivalent Noise Resistance = 1500 ohms and Output Resistor = 25000 ohms. For second stage, Voltage Gain of Amplifier 2 (A_2)= 20, Input Resistor = 82000 ohms, Equivalent Noise Resistance = 9000 ohms and Output Resistor = 1000000 ohms. Evaluate the equivalent noise resistance of this two stage amplifier. Also indicate noise figure of the amplifier in decibels, if it is driven by a generator with an internal resistance of 40 ohms?

- Q.3**
- What is modulation and demodulation in a communication system? (4)
 - Describe briefly amplitude modulation, and give its applications? (4)
 - Develop a mathematical expression for Amplitude Modulation Index and what happens if this index exceeds 1? (4)
 - A transmitter radiates 10 KW with the carrier unmodulated, and 11.8 KW when the carrier is sinusoidally amplitude modulated. Determine Modulation Index and Percent of Modulation? If another sine wave with 50% modulation is transmitted simultaneously, evaluate the total transmitted power? (4)
- Q.4**
- What are the advantages and disadvantages of frequency modulation in comparison to amplitude modulation? (7)
 - In a frequency modulation system, when the modulating audio frequency (AF) is 800 Hz and the audio frequency (AF) voltage is 5 volts and the deviation in carrier is 10 KHz. If the AF voltage is now increased to 12 volts, what would be the new deviation? Also calculate Modulation Index for these two cases?(7)
 - What is the bandwidth of the voice frequency range? (2)
- Q.5**
- Draw the Block Diagram of basic superheterodyne receiver and briefly explain it's working. Give its uses. (8)
 - When a Superheterodyne Receiver is tuned to 455 KHz, its Local Oscillator provides the mixer with an input of 1455 KHz. What is the Image Frequency? The Antenna of this receiver is connected to the Mixer via a Tuned Circuit whose Loaded Q is 100. What will be the Rejection Ratio for the calculated Image Frequency? (8)
- Q.6**
- What is an Antenna? What functions it fulfills? (3)
 - What is Omnidirectional Antenna and Directional Antenna? (3)
 - What is Antenna Directive Gain? (3)
 - A Directive Antenna is able to radiate 500 watts and has a gain of 2 dB over an Omnidirectional Antenna. How much power must be fed into the Omnidirectional Antenna to match power of Directive Antenna? (7)

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- Q.7** a. What is an Electromagnetic Wave? Why it is called so? What is a Radio Wave? (2)
- b. What is Wave Propagation? Briefly describe sky waves, and indicate how they propagate. (3)
- c. What are Waveguides? Briefly describe the working principle of a Waveguide by explaining the propagation of waves in it? Explain how a section of Rectangular Waveguide depends upon the frequency of the signal? (7)
- d. Rectangular Waveguide is having inside dimensions of 5×2 cms. Calculate the cutoff frequency with a dominant mode of $TE_{1,0}$? (4)
- Q.8** a. What is Information Theory and Coding of Information? Briefly describe Baudot Code? (5)
- b. What is Pulse Amplitude modulation and describe briefly its generation and demodulation with the help of input and output waveforms. (6)
- c. Describe briefly Telex system. What are its advantages over a Telegraph system? (5)
- Q.9** a. Briefly describe Broadband Communication? (4)
- b. What is Multiplexing and what were the reasons for developing it? What are its two basic forms of Multiplexing? (6)
- c. What is a Geostationary Satellite? How it helps in communication? Briefly describe satellite communication system? (6)