CHAPTER - E

COMMUNICATION SYSTEM

Date Planned : __ / __ / __	Daily Tutorial Sheet - 1	Expected Duration : 90 Min
Actual Date of Attempt : __ / __ / __	Level - 1	Exact Duration :_____

1. An antenna is of height 500 *m*. What will be its range (Radius of earth is 6400 *km*) ?

(A) 800 *km* **(B)** 100 *km* **(C)** 50 *km* **(D)** 80 *km*

2. In Optical communication system operating at 1200 nm, only 2% of the source frequency is available for TV transmission having a bandwidth of 5 MHz. The number of TV channels that can be transmitted is:

(A) 2 million **(B)** 10 million **(C)** 0.1 million **(D)** 1 million

3. If $E_c = 20\sin 10^5 \pi t$ and $E_m =$ 10sin 400 πt are carrier and modulating signals respectively, the modulation index is :

(A) 56% **(B)** 30% **(C)** 50% **(D)** 48%

4. The range frequencies allotted for F M radio is :

(A) 88 to 108 kHz **(B)** 88 to 108 MHZ **(C)** 47 to 230 kHz **(D)** 47 to 230 MHz

5. What should be minimum length of antenna for efficient transmission of signals of Wavelength λ ?

(A) $\frac{\lambda}{2}$ **(B)** $\frac{\lambda}{3}$ **(C)** $\frac{\lambda}{4}$ **(D)** $\frac{\lambda}{5}$

6. Advantage of optical fibre is :

(A) High band width and E M interference

(B) Law band width and E M interference

(C) High band width band low transmission capacity and no E M interference

(D) High band width, high data transmission capacity and no E M interference

7. The process of superimposing signal frequency (i.e., audio wave) on the carrier wave is known as:

(A) transmission **(B)** reception **(C)** modulation **(D)** detection

8. Propagation constant of a transmission line is:

(A) $\frac{R + j\omega L}{G + j\omega C}$ **(B)** $\sqrt{(R + j\omega L)(G + j\omega C)}$

(C) $\sqrt{1/LC}$ **(D)** $\sqrt{(R - j\omega L)(G - j\omega C)}$

9. In an amplitude modulated wave for audio-frequency of 500 cycle/second, the appropriate carrier frequency will be:

(A) 50 cycle/sec **(B)** 100 cycle/sec **(C)** 500 cycle/sec **(D)** 50,000 cycle/sec

10. Radio waves of constant amplitude can be generated with:

(A) filter **(B)** rectifier **(C)** fet **(D)** oscillator

11. Which of the following given statements is not true for the modulation?

(A) It reduces the bandwidth

(B) It ensure transmission over long distances

(C) It facilitates the use of antennas practically

(D) It is a frequency translation process

12. In satellite communication

(i) the frequency used lies between 5 MHz and 10 MHz

(ii) the uplink and downlink frequencies are same

(iii) the orbit of geostationary satellite lies in the equatorial plane at an inclination of 0°

(A) only 1 **(B)** 1 and 3 **(C)** 1 and 2 **(D)** 2 and 3

13. Which of the following statements is wrong?

(A) Sky wave propagation is useful in the range of 30 to 40 MHz

(B) Space wave propagation is through troposphere

(C) Satellite communication for frequencies about 30 Mhz

(D) Ground wave propagation is between 500 kHz < 1500 kHz

14. If the critical frequency for sky wave propagation is 12 MHz, then the maximum electron density in the ionosphere is:

(A) $0.14 \times 10^{12} / m^3$ **(B)** $0.28 \times 10^{12} / m^3$

(C) $1.78 \times 10^{12} / m^3$ **(D)** $2.12 \times 10^{12} / m^3$

15. The sampling technique in communication process results in:

(A) less costly equipments **(B)** better efficiency

(C) highest communication speed **(D)** none of the above

JEE Main (Archive)

1. Consider telecommunication through optical fibres. Which of the following statements is not true?

(A) Optical fibres can be of graded refractive index. **[2003]**

(B) Optical fibres are subject to electromagnetic interference from outside

(C) Optical fibres have extremely low transmission loss

(D) Optical fibres may have homogeneous core with a suitable cladding

2. This question has Statement – 1 and Statement – 2. Of the four choices given after the statements, choose the one that best describes the two statements. **[2011]**

Statement – 1 : Sky wave signals are used for long distance radio communication. These signals are in general, less stable than ground wave signals.

Statement – 2 : The state of ionosphere varies from hour to hour, day to day and season to season.

(A) Statement-1 is true, Statement-2 is true; Statement-2 is the correct explanation of Statement-1.

(B) Statement-1 is true, Statement-2 is true; Statement-2 is not the correct explanation of Statement-1.

(C) Statement-1 is false, Statement-2 is true.

(D) Statement-1 is true, Statement-2 is false.

3. Which of the following four alternatives is not correct? We need modulation : **[2012]**

(A) to reduce the fractional band with, that is, the ratio of the signal band width to the centre frequency.

(B) to increase the selectivity

(C) to reduce the time lag between transmission and reception of the information signal

(D) to reduce the size of antenna

4. For sky wave propagation, the radio waves must have a frequency range in between: **[2014]**

(A) 1 MHz to 2 MHz **(B)** 5 MHz to 25 MHz

(C) 35 MHz to 40 MHz **(D)** 45 MHz to 50 MHz

5. Long range radio transmission is possible when the radiowaves are reflected from the ionosphere. For this to happen the frequency of the radiowaves must be in the range. **[2014]**

(A) 80 – 150 *MHz* **(B)** 8 – 25 *MHz* **(C)** 1 – 3 *MHz* **(D)** 150 – 500 *KHz*

6. If we denote microwaves, X rays, infrared, gamma rays, ultra-violet, radio waves and visible parts of the electromagnetic spectrum by M, X, I, G U, R and V, the following is the arrangement in ascending order of wavelength : **[2014]**

(A) R, M, I V, U, X and G **(B)** M, R, V, X U, G and I

(C) G, X U, V I, M and R **(D)** I, M, R, U, V, X and G

7. A transmitting antenna at the top of a tower has a height 32 m and the height of the receiving antenna is 50 m. What is the maximum distance between them for satisfactory communication in line of sight (LOS) mode? **[2014]**

(A) 55.4 km **(B)** 45.5 km **(C)** 54.5 km **(D)** 455 km

8. Match **List-I** (Electromagnetic wave type) with **List-II** (its association / application) and select the correct option from the choices given below the lists : **[2014]**

	List – I		**List – II**
(1)	Infrared waves	**(i)**	To treat muscular strain
(2)	Radio waves	**(ii)**	For broadcasting
(3)	X-rays	**(iii)**	To detect fracture of bones
(4)	Ultraviolet waves	**(iv)**	Absorbed by the ozone layer of the atmosphere

	1	**2**	**3**	**4**
(A)	(iii)	(ii)	(i)	(iv)
(B)	(i)	(ii)	(iii)	(iv)
(C)	(iv)	(iii)	(ii)	(i)
(D)	(i)	(ii)	(iv)	(iii)

9. Match List I (Wavelength range of electromagnetic spectrum) with List II. (Method of production of these waves) and select the correct option from the options given below the lists **[2014]**

	List I		**List II**
(1)	700 nm to 1 mm	(i)	Vibration of atoms and molecules
(2)	1 nm to 400 nm	(ii)	Inner shell electrons in atoms moving from one energy level to a lower level.
(3)	$< 10^{-3}$ nm	(iii)	Radioactive decay of the nucleus
(4)	1 mm to 0.1 m	(iv)	Magnetron valve.

(A) (1)-(iv), (2)-(iii), (3)-(ii), (4)-(i) **(B)** (1)-(iii), (2)-(iv), (3)-(i), (4)-(ii)
(C) (1)-(ii), (2)-(iii), (3)-(iv), (4)-(i) **(D)** (1)-(i), (2)-(ii), (3)-(iii), (4)-(iv)

10. Choose the correct statement : **[2016]**

(A) In amplitude modulation the frequency of the high frequency carrier wave is made to vary in proportion to the amplitude of the audio signal.

(B) In frequency modulation the amplitude of the high frequency carrier wave is made to vary in proportion to the amplitude of the audio signal.

(C) In frequency modulation the amplitude of the high frequency carrier wave is made to vary in proportion to the frequency of the audio signal

(D) In amplitude modulation the amplitude of the high frequency carrier wave is made to vary in proportion to the amplitude of the audio signal.

11. A telephonic communication service is working at carrier frequency of 10 GHz. Only 10% of it is utilized for transmission. How many telephonic channels can be transmitted simultaneously if each channel requires a bandwidth of 5 kHz? **[2018]**

(A) 2×10^6 **(B)** 2×10^3 **(C)** 2×10^4 **(D)** 2×10^5

12. In a communication system operating at wavelength 800 nm, only one percent of source frequency is available as signal bandwidth. The number of channels accommodated for transmitting TV signals of band width 6 MHz are (Take velocity of light $c = 3\times10^8 m/s$, $h = 6.6\times10^{-34} J\text{-}s$) **[2019]**

(A) 6.25×10^5 **(B)** 4.87×10^5 **(C)** 3.75×10^6 **(D)** 3.86×10^6

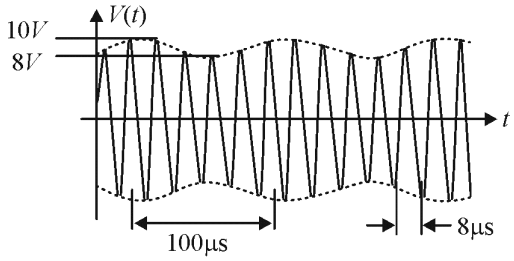
13. The modulation frequency of an AM radio station is 250kHz, which is 10% of the carrier wave. If another AM station approaches you for license what broadcast frequency will you allot? **[2019]**

(A) 2000kHz **(B)** 2900kHz **(C)** 2750kHz **(D)** 2250kHz

14. A TV transmission tower has a height of 140m and the height of the receiving antenna is 40 m. What is the maximum distance upto which signals can be broadcasted from this tower in LOS (Line of Sight) mode? (Given : radius of earth = $6.4\times10^6 m$). **[2019]**

(A) 65 km **(B)** 80 km **(C)** 48 km **(D)** 40 km

15. An amplitude modulated signal is plotted below: **[2019]**



Which one of the following best describes the above signal?

(A) $\left(9+\sin\left(2\pi\times10^4 t\right)\right)\sin\left(2.5\pi\times10^5 t\right)V$ **(B)** $\left(1+9\sin\left(2\pi\times10^4 t\right)\right)\sin\left(2.5\pi\times10^5 t\right)V$

(C) $\left(9+\sin\left(4\pi\times10^4 t\right)\right)\sin\left(5\pi\times10^5 t\right)V$ **(D)** $\left(9+\sin\left(2.5\pi\times10^5 t\right)\right)\sin\left(2\pi\times10^4 t\right)V$

16. An amplitude modulated signal is given by $V(t)=10\left[1+0.3\cos\left(2.2\times10^4 t\right)\right]\sin\left(5.5\times10^5 t\right)$. Here t is in seconds. The sideband frequencies $(in\ kHz)$ are, [Given $\pi = 22/7$] **[2019]**

(A) 1785 and 1715 **(B)** 89.25 and 85.75

(C) 178.5 and 171.5 **(D)** 892.5 and 857.5

17. To double the covering range of a TV transmittion tower, its height should be multiplied by: **[2019]**

(A) $\sqrt{2}$ **(B)** 4 **(C)** $1/\sqrt{2}$ **(D)** 2

18. A 100 V carrier wave is made to vary between 160 V and 40 V by a modulating signal. What is the modulation index? **[2019]**

(A) 0.6 **(B)** 0.5 **(C)** 0.4 **(D)** 0.3

19. The wavelength of the carrier waves in a modern optical fiber communication network is close to :

(A) 900 nm **(B)** 600 nm **(C)** 1500 nm **(D)** 2400 nm **[2019]**

20. In a line of sight radio communication, a distance of about 50 km is kept between the transmitting and receiving antennas. If the height of the receiving antenna is 70 m, then the minimum height of the transmitting antenna should be:

(Radius of the Earth $=6.4\times10^6 m$). **[2019]**

(A) 51 m **(B)** 40m **(C)** 20 m **(D)** 32 m

21. A signal $A\cos\omega t$ is transmitted using $v_0 \sin\omega_0 t$ as carrier wave. The correct amplitude modulated (AM) signal is: **[2019]**

(A) $v_0 \sin\omega_0 t + \frac{A}{2}\sin(\omega_0 - \omega)t + \frac{A}{2}\sin(\omega_0 + \omega)t$

(B) $(v_0 + A)\cos\omega t \sin\omega_0 t$

(C) $v_0 \sin[\omega_0(1 + 0.01\ A \sin\omega t)t]$

(D) $v_0 \sin\omega_0 t + A\cos\omega t$

22. The physical sizes of the transmitter and receiver antenna in a communication system are: **[2019]**

(A) Independent of both carrier and modulation frequency

(B) Inversely proportional to carrier frequency

(C) Inversely proportional to modulation frequency

(D) Proportional to carrier frequency

23. Given below in the left column are different modes of communication using the kinds of waves given in the right column. **[2019]**

A.	Optical Fibre Communication	P.	Ultrasound
B.	Radar	Q.	Infrared Light
C.	Sonar	R.	Microwaves
D.	Mobile Phones	S.	Radio Waves

From the options given below, find the most appropriate match between entries in the left and the right column.

(A) A-R, B-P, C-S, D-Q **(B)** A-Q, B-S, C-P, D-R

(C) A-Q, B-S, C-R, D-P **(D)** A-S, B-Q, C-R, D-P

24. A message signal of frequency 100 MHz and peak voltage 100 *V* is used to execute amplitude modulation on a carrier wave of frequency 300 GHz and peak voltage 400 *V*. The modulation index and difference between the two side band frequencies are: **[2019]**

(A) $4; 1\times10^8 Hz$ **(B)** $0.25; 2\times10^8 Hz$ **(C)** $4; 2\times10^8 Hz$ **(D)** $0.25; 1\times10^8 Hz$

25. In an amplitude modulator circuit, the carrier wave is given by, $C(t) = 4 \sin(20000\ \pi t)$ while modulating signal is given by, $m(t) = 2 \sin(2000\ \pi t)$. The values of modulation index and lower side band frequency are: **[2019]**

(A) 0.3 and 9 kHz **(B)** 0.5 and 10 kHz **(C)** 0.4 and 10 kHz **(D)** 0.5 and 9 kHz

26. An amplitude modulated wave is represented by the expression $v_m = 5(1 + 0.6\cos 6280\ t)\sin(211\times10^4 t)$ volts. The minimum and maximum amplitudes of the amplitude modulated wave are, respectively: **[2020]**

(A) $5V, 8V$ **(B)** $3V, 5V$ **(C)** $\frac{5}{2}V, 8V$ **(D)** $\frac{3}{2}V, 5V$