PHYSICS

BOOKS - MHTCET PREVIOUS YEAR PAPERS AND PRACTICE PAPERS

COMMUNICATION SYSTEM

Example

1. A transmitting antenna has a height 30m and that of the receiving atenna is 52 m . What

is the maximum distance between them for satisfactory communication in line of sight mode ? Given , radius of earth is 6.4×10^6m .

A. 45. 4 km

B. 44. 5 km

C. 36.3 km

D. 33.6 km

Answer: A

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2. Find out the maximum electron density of the ionosphere if the maximum frequency of the radiowaves which returns to the earth after reflecting from the ionosphere is 18 MHz.

A. $8m^{-3}$

B. $6m^{-3}$

C. $4m^{-8}$

D. $2m^{-3}$

Answer: C

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3. On a particular day, the maximum frequency reflected from the ionosphere is 10 MHz. On another day, it was found to increase to 11 MHz. Calculate the ratio of the maximum electron densities of the ionosphere on the two days. Point out a plausible explanation for this.

A. 1.21

B. 0.82

C. 0.50

D. 0.25

Answer: A

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4. The frequency of a wave propagating in D-region having refractive index of 0.5 is

A. $420kcs^{-1}$

B. $300kcs^{-1}$

C. $329.5kcs^{-1}$

D. $350kcs^{-1}$

Answer: C

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5. The maximum and minimum amplitude of AM wave is found to be 15 V and 3 V , respectively . The amplitudes of carrier wave and modulating wave will be

A. 9 and 6 V

B. 6 and 9 V

C. 18 and 9 V

D. 24 and 16 V

Answer: A

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6. An audio signal of amplitude 0.1 V is used is used in amplitude modulation of a carrier wave of amplitude 0.2 V. Calculate the modulation index.

A. 1

B. 0.5

C. 1.5

D. 2

Answer: B

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7. A 107.6 MHz carrier signal is frequency modulated by a 7kHz sine wave . The resultant FM signal has a frequency deviation of 50 kHz.

Determine the modulation index and the carrier swing of the FM wave

A. 7.143 and 100 kHz

B. 8.234 and 75 kHz

C. 6.289 and 150 kHz

D. 5.103 and 14 kHz

Answer: A

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Exercise 1

1. Audio frequency range is from

A. 20Hz to 20 MHz

B. 0 to 2 kHz

C. 20 Hz to 20 kHz

D. 20 kHz to 200 kHz

Answer: C

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2. The electromagnetic waves used in the telecommunication are

A. ultraviolet

B. infrared

C. visible

D. microwave

Answer: D

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3. A device that converts one from of energy into another form is termed as

A. attenuator

B. transmitter

C. receiver

D. transducer

Answer: D

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4. Identify the incorrect statement from the following .

A. AM detection is carried out using a rectifier and an envelop detector

B. Pulse position denotes the time of rise or fall of the pulse amplitude

C. Modulation index μ is kept $\geq$ 1 , to avoid distortion

D. Facsamile (FAX) scans the contents of the document to create electronic signals

Answer: C

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5. Audio signal cannot be transmitted because

A. the signal has more noise

B. the signal cannot be amplified for distance communication

C. the transmitting atenna length is very small to design

D. the transmitting antenna length is very large and impractiable

Answer: D

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6. Major parts of communications systems are:

A. transmitter and receiver

B. receiver and communication channel

C. transmitter and communication channel

D. transmitter , receiver and communication channel

Answer: D

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7. Digital signals

A. do not provide a continuous set of values

B. utilises binary systems

C. ensures error and noise free comunication

D. All of the above

Answer: D

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8. The mobile telephones operate typically in the range of

A. 1-100 MHz

B. 100-200 MHz

C. 1000-2000 MHz

D. 800-950 MHz

Answer: D

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9. The number of telephonic messages which are carried by a fibre at an instant with much less intensity loss are

A. 2400

B. 2200

C. 2000

D. 1800

Answer: C

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10. Basic components of a transmitter are:

A. message signal generator and antenna

B. modulator and antenna

C. signal generator and modulator

D. message signal generator , modulator and antenna

Answer: D

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11. In a video signal for transmission of picture. What value of bandwidth is used in communication system?

A. 2.4 MHz

B. 4.2 MHz

C. 24MHz

D. 42MHz

Answer: B

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12. Range of frequencies allotted for commercial UHF TV broadcast is

A. 470-960 kHz

B. 47-960 MHz

C. 470-960 MHz

D. 47-960 kHz

Answer: C

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13. The ratio waves of frequency $300MHz$ to $3000MHz$ belong to

A. high frequency band

B. very high frequency band

C. ultra high frequency band

D. super high frequency band

Answer: B

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14. If electron density of the layer of inosphere is 10×10^{11} and k is a constant , then critical frequency for reflection of radiowaves is

A. $k \times 10^{18} Hz$

B. $k \times 10^{12} Hz$

C. $k \times 10^{7} Hz$

D. $k \times 10^{6} Hz$

Answer: D

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

A. $1.78 \times 10^{12} m^{-3}$

B. $0.178 \times 10^{10} m^{-3}$

C. $1.12 \times 10^{12} m^{-3}$

D. $0.56 \times 10^{12} m^{-3}$

Answer: A

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16. The sky wave propagation is suitable for radiowaves of frequency

A. upto 2 MHz

B. from 2 MHz to 20 MHz

C. from 2 MHz to 30 MHz

D. $0.56 \times 10^{12} m^{-3}$

Answer: C

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17. A signal emitted by an antenna from a certain point can be received at another point of the surface in the form of

A. sky wave

B. ground wave

C. sea wave

D. Both (a) and (b)

Answer: D

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18. Which of the following frequencies will be suitable for beyond the horizon communication using sky waves?

A. 10 kHz

B. 10 MHz

C. 1 GHz

D. 1000 GHz

Answer: B

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19. Is it necessary for a transmitting antenna to be at the same height asthat of the receiving antanna for line of sight communication? A TV transmitting antenna is 81 m tall. How much service area can it cover, if the receiving antena is at the ground level?

A. $3800km^2$

B. $3260km^2$

C. $7400km^2$

D. $3320km^2$

Answer: B

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20. When electromagnetic waves enter the ionised layer of ionosphere, then the relative permittivity i.e. dielectric constant of the ionised layer

A. does not change

B. appears to increase

C. appears to decreases

D. sometimes e appears to increase and sometimes to decreases

Answer: C

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21. Name the type of waves which are used for line of sight (LOS) communication. What is the range of their frequencies?

A transmitting antenna at the top of a tower has a height of 20m and the height of the

receiving antenna is 45m. Calculate the maximum distance between them for satisfactory communication in LOS mode. (Radius of the Earth $= 6.4 \times 10^6$ m)

A. ground waves

B. space waves

C. sky waves

D. both (b) & (c)

Answer: B

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22. In space communcation , the information can be passed from on place to another at a distance of 100 km in

A. 1 s

B. 0.5 s

C. 0.003 s

D. None of these

Answer: D

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23. What fraction of the surface area of earth can be covered to establish communication by one geostationary satellite ?

A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. $\frac{1}{4}$

D. $\frac{1}{8}$

Answer: B

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24. Beyond which frequency, the ionosphere bends any incident electromagnetic radiation but does not reflect if back towards the earth?

A. 50 MHz

B. 40 MHz

C. 30 MHz

D. 20 MHz

Answer: B

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25. For sky wave propagation of a $10MHz$ signal, what should be the minimum electron density in ionosphere?

A. ~$1.2 \times 10^{12} m^{-3}$

B. ~$10^{6} m^{-3}$

C. ~$2.3 \times 10^{-4} m^{-3}$

D. ~$10^{22} m^{-3}$

Answer: A

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26. In earth's atmosphere for F_1-layer , the virutal height and critical frequency are

A. 150 km and 3 MHz

B. 160 km and 3.5 MHz

C. 170 km and 4.5 MHz

D. 180 km and 5MHz

Answer: D

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27. Fading is the variation in the strength of a signal at a receiver due to

A. interference of waves

B. diffraction of waves

C. polarisation of waves

D. None of these

Answer: A

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28. In earth's atmosphere for E- layer , the virtual height and critical frequency are

A. 80 km and 3 MHz

B. 90 km and 3.5 MHz

C. 120 km and 4.5 MHz

D. 110 km and 4 MHZ

Answer: D

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29. If the TV telecast is to cover a radius of 120 km (Given , the radius of the earth = 6400 km), the height of the transmitting antenna is

A. 1280 m

B. 1125 m

C. 1560 m

D. 79 m

Answer: B

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30. Space wave propagation is used in

(a) microwave communication

(b) satellite communication

(c) TV transmission

A. television communication

B. radar communication

C. microwave communication

D. All of the above

Answer: D

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31. Ozone layer above earth's atmosphere will not

A. prevent infrared radiations from sun reaching on earth

B. prevent infrared radiations originated from earth from escaping earth's atmosphere

C. prevent ultraviolet rays from sun

D. reflect back radiowaves

Answer: D

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32. The air of earth's atmosphere responsible for absorbing a large portion of ultraviolet radiations by the sun is

A. mesosphere

B. troposphere

C. ozone layer

D. ionosphere

Answer: C

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33. Match the following column I and Column II

Column I Space Communication		Column II Frequencies
I. Ground wave propagation	A.	30 MHz to 300 MHz
II. Sky wave propagation	B.	8 MHz to 200 MHz
III. Space wave propagation	C.	2 MHz to 30 MHz
IV. Television signal propagation	D.	500 kHz to 1500 kHz

A. I-D,II-C,III-A,IV-B

B. I-A,II-B,III-C,IV-D

C. I-B,II-A,III-D,IV-C

D. I-C,II-D,III-B,IV-A

Answer: A

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34. A radiowave that travels in a straight line from the transmitting antenna to the receiving antenna is know as

A. sky wave

B. ground wave

C. space wave

D. ionospheric wave

Answer: C

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35. In process of amplitude modulation of signal to be transmitted .

Signal to be modulated is given by

$m(t) = A_m \sin \omega_m t$, carrier wave is given by $c(t) = A_c \sin \omega_c t$, modulated signal $c_m(t)$ is given by

A. $C_m(t) = A_c \sin \omega_c t + A_m \sin \omega_m t$

B. $C_m(t) = (A_c + A_m) \sin \omega_c t$

C. $C_m(t) = [A_c + m(t)] \sin \omega_c t$

D. None of the above

Answer: C

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36. In amplitude modulation, carrier wave frequencies are:

A. lower compared to those in frequency modulation

B. higher compared to those in frequency modulation

C. some as in frequency modulation

D. lower sometimes and higher sometimes to those in frequency modulation

Answer: A

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37. In a detector, output circuit consists of $R = 10k\Omega$ and $C = 100pF$. Calculate the frequency of carrier signal it can detect.

A. $> > 1MHz$

B. $0.1kHz$

C. $> > 1GHz$

D. $10^3 Hz$

Answer: A

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38. For efficient transmission, transmitting antenna has length comparable to

A. $\lambda/2$

B. $\lambda/3$

C. $\lambda/4$

D. $\lambda/5$

Answer: C

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39. A radio transmitter radiates $1kW$ power at a wavelength $198.6m$. How many photons does it emit per second ?

A. 10^{10}

B. 10^{20}

C. 10^{30}

D. 10^{40}

Answer: C

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40. A $100m$ long anteena is mounted on a $500m$ tall building. The complex can become a transmission tower for waves with λ.

A. ~$400m$

B. ~$25m$

C. ~$150m$

D. ~$2400m$

Answer: A

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41. A 1000 kHz carrier wave is modulated by an audio signal of frequency range 100-5000 Hz. Then, the width of channel (in kHz) is

A. 10 kHz

B. 20 kHz

C. 30 kHz

D. 40 kHz

Answer: A

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42. In frequency modulation

A. the amplitude of modulated wave varies as frequency of carrier wave

B. the frequency of modulated wave varies as amplitude of modulating wave

C. The amplitude of modulated wave varies as amplitude of carrier wave

D. The frequency of modulated wave varies as frequency of modulating wave

Answer: B

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43. In frequency modulated wave

A. frequency varies with time

B. amplitude varies with time

C. both frequency and amplitude vary with time

D. both frequency and amplitude are constant

Answer: A

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44. A speech signal of $3kHz$ is used to modulate a carrier signal of frequency $1MHz$, using amplitude modulation. The frequencies of the side bands will be

A. 1.003 MHz and 0.997 MHz

B. 1.954 MHz and 2.0 MHz

C. 40.5 MHz and 27.6 MHz

D. 5 MHz and 0.997 MHz

Answer: A

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45. A transducer , in communication system in a device that

A. is a part of the antenna

B. is a combination of a receiver and a transmitter

C. converts audio signals into video signals

D. converts physical variable into corresponding variation in the electical

signal

Answer: D

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46. In an amplitude modulated wave , the maximum amplitude is 10V and the modulation index is 2/3 m , then the minimum amplitude is (in volt)

A. 7

B. 9

C. 6

D. 2

Answer: D

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47. Which of the following is not transducer?

A. Loudspeaker

B. Amplifier

C. Microphone

D. All of these

Answer: B

48. An oscillator is producing FM waves of requency $2kHz$ with a variation of $10kHz$. What is modulating index?

A. 0.20

B. 5.0

C. 0.67

D. 1.5

Answer: B

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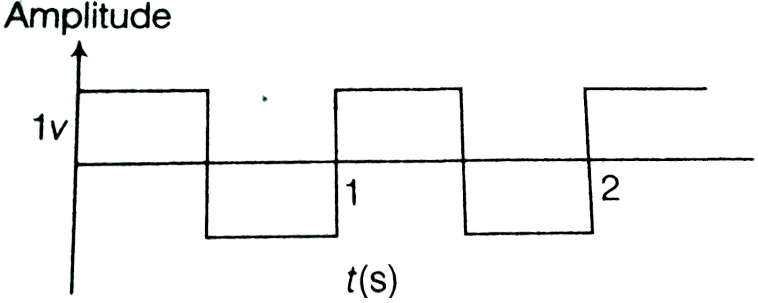
49. A modulating signal is a square wave as shown in the following figure .



While the carries wave is given by $e = 4\sin(8\pi t)$ volt . What is the modulation index ?

A. 0.15

B. 0.25

C. 0.35

D. 10.5

Answer: B

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50. A sinusoidal carrier wave of amplitude 40 V is amplitude modulated by a sinusoidal signal voltage. What is the amplitude of each side band if the modulation index is 25%.

A. 5V

B. 4V

C. 6V

D. 18V

Answer: A

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Exercise 2

1. Which of the following four alternatives is not correct, We need modulation :-

A. to increase the selectivity

B. to reduce the time lag between transmission and reception of the

information signal

C. to reduce the size of antenna

D. to reduce the fractional band width , that is the time of the signal band width to the centre frequency .

Answer: B

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2. Range of frequencies allotted for commercial FM radio broadcast is

A. 88 to 208 kHz

B. 88 to 108 MHz

C. 47 to 230 kHz

D. 47 to 230 MHz

Answer: B

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3. Identify the mathematical expression for amplitude modulated wave:

A. $A_c \sin[\{\omega_9 c) + k_1(v_m)\}t + \phi]$

B. $A_c \sin\{\omega_c t + \phi + k_2 v_m(t)\}$

C. $\{A_c + k_2 v_m(t)\}\sin(\omega_c t + \phi)$

D. $A_c(v_m)(t)\sin(\omega_c t + \phi)$

Answer: C

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4. A male voice after modulation-transmission sounds like that of a female to the receiver. The problem is due to

A. poor selection of modulation index

B. poor bandwidht selection of amplifiers

C. poor selection of carrier frequency

D. loss of energy in transmission

Answer: B

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

A. 0.56

B. 0.3

C. 0.5

D. 0.48

Answer: C

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6. A signal wave of frequency 12 kHz is modulated with a carrier wave of frequency 2-51 MHz. The upper and lower side band frequencies are respectively.

A. 2512 kHz and 2508 kHz

B. 2522 kHz and 2488 kHz

C. 2502 kHz and 2498 kHz

D. 2522 kHz and 2498 kHz

Answer: D

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7. An oscillator is producing FM waves of requency $2kHz$ with a variation of $10kHz$. What is modulating index?

A. 0.20

B. 5.0

C. 0.67

D. 1.5

Answer: B

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8. A message signal frequency ω_m is superpiosed on a carrier wave of frequency ω_c to gent an amplitude modulated wave (AM).The frequency of the AM wave will be

A. ω_m

B. ω_c

C. $\frac{\omega_c + \omega_m}{2}$

D. $\frac{\omega_c - \omega_m}{2}$

Answer: B

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9. Three waves A,B and C of frequencies 1600 kHz, 5 MHz and 60 MHz, respectively are to be transmitted from one place to another.Which of the following is the appropriate mode of communication?

A. A is transmitted via space wave while B and C are transmitted via sky wave

B. A is transmitted via ground wave while B and C are transmitted via space wave

C. B and C are transmitted via ground wave while A is transmitted via sky wave

D. B is transmitted via ground wave while A and C are transmitted via space wave

Answer: B

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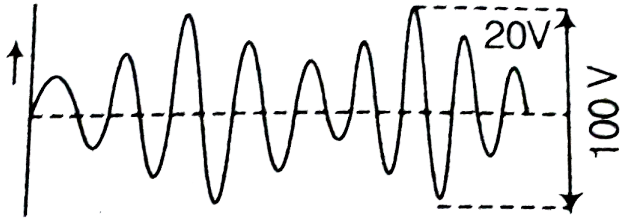
10. An amplitude modulated wave is as shown in figure . Then , the modulation index will be



A. 0.20

B. 0.50

C. 0.67

D. 0.8

Answer: C

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11. 1000 kHz carrier wave is amplitude modulated by the signal frequency 200-4000Hz . The channel width of this case is

A. 8kHz

B. 4kHz

C. 7.6kHz

D. 3.8 kHz

Answer: A

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12. A single of 5 kHz frequency is amplitude modulated on a carrier wave of frequency 2 MHz. The frequencies of the resultant signal is/are :-

A. 2MHz only

B. 2005 kHz and 1995 kHz

C. 2005 kHz 2000 kHz and 1995 kHz

D. 2000 kHz and 1995 kHz

Answer: C

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13. Two waves A and B of frequencies 2MHz and 3 MHz, respectively are beamed in the same direction for communication via sky wave. Which one of these is likely to travel longer distance in the ionosphere before suffering total internal reflection?

A. A

B. B

C. Both (a) and (b)

D. None of these

Answer: B

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14. Match the following given in Column I with names given in Column II and choose the

correct option from the codes given below.

Column I	Column II
A. 1936	1. First radio FXA transmitted across continent (Alexander Bain).
B. 1955	2. ARPANET–The first internet came into existence (JCR Licklinder).
C. 1968	3. Tim Berners-Lee invented the World Wide Web
D. 1975	4. Television Broadcast (John Logi Baird).
E. 1989-91	5. Fibre optics developed at Bell laboratories.

A. $A-3, B-1, C-2, D-4, E-5$

B. `A-2,B-1,C-3,D-5,E-4

C. A-5,B-3,C-4,D-1,E-2

D. A-4, B-1, 2-C,D-5,E-3

Answer: D

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15. Match the following given in Column I with names given in Column II and choose the correct option from the codes given below to the relation of the given statement . A sinusoidal carrier wave can be represented as $c(t) = A_c \sin(\omega_c t + \phi)$, where

Column I	Column II
A. $c(t)$	1. Amplitude initial phase of the carrier
B. A_c	2. Wave
C. $\omega_c (= 2\pi v_c)$	3. Signal strength (voltage or current)
D. ϕ	4. Angular frequency

A. A-4,B-2,C-1,D-3

B. A-3,B-1,C-2,D-4

C. A-3,B-1,C-4,D-2

D. A-2,B-3,C-4,D-1

Answer: C

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Mhc Cet Corner

1. The maximum frequency of transmitted radio waves above which the radio waves are

no longer reflected back by ionosphere is (N = maximum electron density of ionosphere, g = acceleration due to gravity)

A. gN

B. gN^2

C. $g\sqrt{N}$

D. g^2N^2

Answer: C

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2. The process of regaining of information from carrier wave at the receiver is termed as

A. demodulation

B. modulation

C. attenuation

D. amplification

Answer: A

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3. Which of the following is the communication channel in case of radio communication ?

A. Free space

B. Reception lines

C. Transmission lines

D. None of these

Answer: A

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4. Which of the following is absorbed by the ozone layer ?

A. only gamma rays

B. visible light

C. radio waves

D. ultraviolet

Answer: D

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5. The wave which are reflected back to the earth by ionosphere is

A. ground waves

B. sky waves

C. space wave

D. All of them

Answer: B

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6. Advantages of optical fibres is

A. high band width and EM interference

B. low band width and EM interference

C. high band width low transmission capacity and no EM interference

D. high band width high data transmission capacity and no EM interference

Answer: D

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