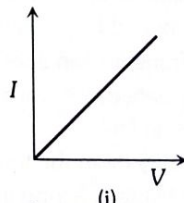


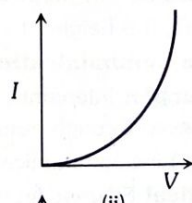
27. Communication – Multiple Choice Questions

1. Communication

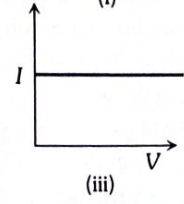
- For television broadcasting, the frequency employed is normally
 - 30-300 MHz
 - 30-300 GHz
 - 30-300 KHz
 - 30-300 Hz
- When a low flying aircraft passes over head, we sometimes notice a slight shaking of the picture on our TV screen. This is due to
 - Diffraction of the signal received from the antenna
 - Interference of the direct signal received by the antenna with the weak signal reflected by the passing aircraft
 - Change of magnetic flux occurring due to the passage of aircraft
 - Vibrations created by the passage of aircraft
- In satellite communication
 - The frequency used lies between 5 MHz and 10 MHz
 - The uplink and downlink frequencies are different
 - The orbit of geostationary satellite lies in the equatorial plane at an inclination of 0°
 In the above statements
 - Only 2 and 3 true
 - All are true
 - Only 2 true
 - Only 1 and 2 true
 - Only 1 and 3 true
- Arrange the following communication frequency bands in the increasing order of frequencies
 - AM broadcast
 - Cellular mobile radio
 - F.M. broadcast
 - Television UHF
 - Satellite communication
 - 1 3 4 2 5
 - 1 2 3 4 5
 - 5 2 4 3 1
 - 1 3 2 4 5
- Why do we need carrier wave of high frequency to transmit audio signal over long distances
 - High frequency carrier wave can propagate with a faster speed
 - High frequency carrier waves offer availability of higher transmission bandwidth
 - High frequency carrier waves offer availability of lower transmission bandwidth
 - High frequency carrier waves is easy to produce
- A basic communication system consists of
 - Transmitter
 - Information source
 - User of information
 - Channel
 - Receive
 Choose the correct sequence in which these are arranged in a basic communication system
 - ABCDE
 - BADEC
 - BDACE
 - BEADC
- In an amplitude modulated wave for audio frequency of 500 cycle/second, the appropriate carrier frequency will be
 - 50 cycles/s
 - 100 cycles/s
 - 500 cycles/s
 - 50,000 cycles/s
- A 1000kHz carrier wave is modulated by an audio signal of frequency range 100-5000Hz. Then the width of the channel in KHz is
 - 10
 - 20
 - 30
 - 40
 - 50
- 1000kHz carrier wave is amplitude modulated by the signal frequency 200 – 4000Hz. The channel width of this case is
 - 8 kHz
 - 4 kHz
 - 7.6 kHz
 - 3.8 kHz
 - 400 kHz
- A message signal of frequency ω_m is superposed on a carrier wave of frequency ω_c to get an Amplitude Modulated Wave (AM). The frequency of the AM wave will be
 - ω_m
 - ω_c
 - $\frac{\omega_c + \omega_m}{2}$
 - $\frac{\omega_c - \omega_m}{2}$
- I-V characteristics of four devices are shown in figure



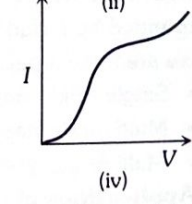
(i)



(ii)



(iii)



(iv)

 Identify devices that can be used for modulation
 - (i) and (iii)
 - Only (iii)
 - (ii) and some regions of (iv)
 - All the devices can be used

- 12.** A male voice after modulation – transmission sounds like that of a female to the receiver. The problem is due to
- Poor selection of modulation index (Selected $0 < m < 1$)
 - Poor bandwidth selection of amplifiers
 - Poor selection of carrier frequency
 - Loss of energy in transmission
- 13.** Identify the mathematical expression for amplitude modulated wave
- $A_c \sin[\{\omega_c + k_1 V_m(t)\}t + \phi]$
 - $A_c \sin\{\omega_c t + \phi + k_2 V_m(t)\}$
 - $\{A_c + k_2 V_m(t)\} \sin(\omega_c t + \phi)$
 - $A_c V_m(t) \sin(\omega_c t + \phi)$
- 14.** The velocity of all radio waves in free space is 3×10^8 m/s. The frequency of a radio wave of wavelength 150m is
- 20 kHz
 - 2 kHz
 - 2 MHz
 - 1 MHz
- 15.** A 100m long antenna is mounted on a 500m tall building. The complex can become a transmission tower for waves with λ
- ~ 400 m
 - ~ 25 m
 - ~ 150 m
 - ~ 2400 m
- 16.** Sinusoidal carrier voltage of frequency 1.5 MHz and amplitude 50 V is amplitude modulated by sinusoidal voltage of frequency 10 kHz producing 50% modulation. The lower and upper side-band frequencies in kHz are
- 1490, 1510
 - 1510, 1490
 - $\frac{1}{1490}, \frac{1}{1510}$
 - $\frac{1}{1510}, \frac{1}{1490}$
- 17.** 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
- 2512 kHz and 2508 kHz
 - 2522 kHz and 2488 kHz
 - 2502 kHz and 2498 kHz
 - 2522 kHz and 2498 kHz
 - 2512 kHz and 2488 kHz
- 18.** A speech signal of 3 kHz is used to modulate a carrier signal of frequency 1 MHz, using amplitude modulation. The frequencies of the side bands will be
- 1.003 MHz and 0.997 MHz
 - 3001 kHz and 2997 kHz
 - 1003 kHz and 1000 kHz
 - 1 MHz and 0.997 MHz
- 19.** A carrier frequency of 1 MHz and peak value of 10V is amplitude modulated with a signal frequency of 10 kHz with peak value of 0.5 V. Then the modulation index and the side band frequencies respectively are
- 0.05 and 1 ± 0.010 MHz
 - 0.5 and 1 ± 0.010 MHz
 - 0.05 and 1 ± 0.005 MHz
 - 0.5 and 1 ± 0.005 MHz
 - 0.05 and 1 ± 0.100 MHz
- 20.** If a number of sine waves with modulation indices n_1, n_2, n_3, \dots modulate a carrier wave, then total modulation index (n) of the wave is
- $n_1 + n_2 + \dots + 2(n_1 + n_2 + \dots)$
 - $\sqrt{n_1^2 + n_2^2 + n_3^2 + \dots}$
 - $\sqrt{n_1^2 + n_2^2 + n_3^2 + \dots}$
 - None of these
- 21.** If the maximum amplitude of an amplitude modulated wave is 25 V and the minimum amplitude is 5 V, the modulation index is
- 1/5
 - 1/3
 - 3/2
 - 2/5
 - 2/3
- 22.** In AM, the centpercent modulation is achieved when
- Carrier amplitude = signal amplitude
 - Carrier amplitude \neq signal amplitude
 - Carrier frequency = signal frequency
 - Carrier frequency \neq signal frequency
- 23.** The audio signal used to modulate $60 \sin(2\pi \times 10^6 t)$ is $15 \sin 300\pi t$. The depth of modulation is
- 50%
 - 40%
 - 25%
 - 15%
- 24.** Identify the incorrect statement from the following
- AM detection is carried out using a rectifier and an envelop detector
 - Pulse Position denotes the time of rise or fall of the pulse amplitude
 - Modulation index μ is kept ≥ 1 , to avoid distortion
 - Facsimile (FAX) scans the contents of the document to create electronic signals
 - Detection is the process of recovering the modulating signal from the modulated carrier wave
- 25.** For an amplitude modulated wave, the maximum amplitude is found to be 12 V and minimum amplitude is found to be 4V. The modulation index of this wave is _____ %
- 25
 - 50
 - 75
 - 20

26. A carrier is simultaneously modulated by two sine waves with modulation indices of 0.4 and 0.3. The resultant modulation index will be

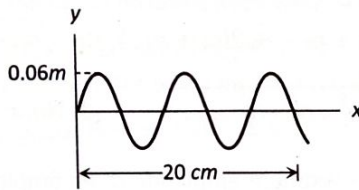
(a) 1.0 (b) 0.7
(c) 0.5 (d) 0.35

27. The maximum peak to peak voltage of an AM wave is 24 mV and the minimum peak to peak voltage is 8 mV. The modulation factor is

(a) 10% (b) 20%
(c) 25% (d) 50%

28. Figure given shows a sinusoidal wave on a string. If the frequency of the wave is 150 Hz and the mass per unit length of the string is 0.2 g/m, the power transmitted by the wave is

(a) 2.34 W
(b) 3.84 W
(c) 4.80 W
(d) 5.78 W



29. The antenna current of an AM transmitter is 8 A when only carrier is sent but increases to 8.96 A when the carrier is sinusoidally modulated. The percentage modulation is

(a) 50% (b) 60%
(c) 65% (d) 71%

30. An amplitude modulated wave is modulated to 50%. What is the saving in power if carrier as well as one of the side bands are suppressed

(a) 70% (b) 65.4%
(c) 94.4% (d) 25.5%

31. A 1 kW signal is transmitted using a communication channel which provides attenuation at the rate of -2 dB per km . If the communication channel has a total length of 5 km, the power

of the signal received is $\left[\text{gain in dB} = 10 \log \left(\frac{P_0}{P_i} \right) \right]$

(a) 900 W (b) 100 W
(c) 990 W (d) 1010 W

32. Long distance short-wave radio broadcasting uses

(a) Ground wave (b) Ionospheric wave
(c) Direct wave (d) Sky wave

33. The electromagnetic waves of frequency 2 MHz to 30 MHz are used

(a) In ground wave propagation
(b) In sky wave propagation
(c) In microwave propagation
(d) In satellite communication

34. The sky wave propagation is suitable for radio-waves of frequency

(a) Upto 2 MHz (b) From 2 MHz to 20 MHz
(c) From 2 MHz to 30 MHz (d) From 2 MHz to 50 MHz

35. Which of the following frequencies will be suitable for beyond the horizon communication

(a) 10 KHz (b) 10 MHz
(c) 1 GHz (d) 1000 GHz

36. 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 most appropriate mode of communication

(a) A is transmitted via spaced wave while B and C are transmitted via sky wave
(b) A is transmitted via ground wave, B via sky wave and C 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

37. The maximum line-of-sight distance d_M between two antennas having heights h_T and h_R above the earth is

(a) $\sqrt{R(h_T + h_R)}$ (b) $\sqrt{2R/(h_T + h_R)}$
(c) $\sqrt{Rh_T} + \sqrt{2Rh_R}$ (d) $\sqrt{2Rh_T} + \sqrt{2Rh_R}$
(e) $\sqrt{2Rh_T} + \sqrt{Rh_R}$

38. The distance of coverage of a transmitting antenna is 12.8 km. Then, the height of the antenna is (Given that radius of earth = 6400 km)

(a) 6.4 m (b) 12.8 m
(c) 3.2 m (d) 16 m
(e) 25.6 m

39. The area of the region covered by the TV broadcast by a TV tower of 100 m height is (radius of the earth = 6.4×10^6 m)

(a) $12.8\pi \times 10^8 \text{ km}^2$ (b) $1.28\pi \times 10^3 \text{ km}^2$
(c) $0.64\pi \times 10^3 \text{ km}^2$ (d) $1.28 \times 10^3 \text{ km}^2$

40. A transmitting antenna of height h and the receiving antenna of height 45 m are separated by a distance of 40 km for satisfactory communication in line of sight mode. Then the value of h is (given radius of earth is 6400 km)

(a) 15 m (b) 20 m
(c) 30 m (d) 25 m
(e) 40 m

41. If both the length of an antenna and the wavelength of the signal to be transmitted are doubled, the power radiated by the antenna

(a) Is doubled (b) Is halved
(c) Remains constant (d) Is quadrupled
(e) Increases 16 times

42. For good demodulation of AM signal of carrier frequency f , the value of RC should be
- (a) $RC = \frac{1}{f}$ (b) $RC < \frac{1}{f}$
 (c) $RC \geq \frac{1}{f}$ (d) $RC \gg \frac{1}{f}$
43. Television signals on earth cannot be received at distances greater than 100 km from the transmission station. The reason behind this is that
- (a) The receiver antenna is unable to detect the signal at a distance greater than 100 km
 (b) The TV programme consists of both audio and video signals
 (c) The TV signals are less powerful than radio signals
 (d) The surface of earth is curved like a sphere
44. An optical fiber can offer a band width of
- (a) 100 MHz (b) 100 GHz
 (c) 750 MHz (d) 250 MHz
45. AM is used for broadcasting because
- (a) It is more noise immune than other modulation systems
 (b) It requires less transmitting power compared with other systems
 (c) Its use avoids receiver complexity
 (d) No other modulation system can provide the necessary bandwidth faithful transmission
46. 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 frequency of modulated wave varies as frequency of modulating wave
 (d) The frequency of modulated wave varies as frequency of carrier wave
47. Maximum usable frequency (MUF) in F-region layer is x , when the critical frequency is 60 MHz and the angle of incidence is 70° . Then x is
- (a) 150 MHz (b) 170 MHz
 (c) 175 MHz (d) 190 MHz
48. The electron density of E , F_1 , F_2 layers of ionosphere is 2×10^{11} , 5×10^{11} and $8 \times 10^{11} \text{ m}^{-3}$ respectively. What is the ratio of critical frequency for reflection of radiowaves
- (a) 2 : 4 : 3 (b) 4 : 3 : 2
 (c) 2 : 5 : 8 (d) 3 : 2 : 4
2. A radar has a power of 1 kW and is operating at a frequency of 10 GHz. It is located on a mountain top of height 500m. The maximum distance upto which it can detect object located on the surface of the earth (Radius of earth = $6.4 \times 10^6 \text{ m}$) is [2012]
- (a) 80 km (b) 16 km
 (c) 40 km (d) 64 km
3. A diode detector is used to detect an amplitude modulated wave of 60% modulation by using a condenser of capacity 250 pico farad in parallel with a load resistance 100 kilo ohm. Find the maximum modulated frequency which could be detected by it [2013]
- (a) 10.62 MHz (b) 10.62 kHz
 (c) 5.31 MHz (d) 5.31 kHz
4. Consider telecommunication through optical fibres. Which of the following statements is not true [2003]
- (a) Optical fibres may have homogeneous core with a suitable cladding
 (b) Optical fibres can be of graded refractive index
 (c) Optical fibres are subject to electromagnetic interference from outside
 (d) Optical fibres have extremely low transmission loss
5. Choose the correct statement [2016]
- (a) In amplitude modulation the frequency of 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
6. In amplitude modulation, sinusoidal carrier frequency used is denoted by ω_c and the signal frequency is denoted ω_m . The bandwidth ($\Delta\omega_m$) of the signal is such that $\Delta\omega_m \ll \omega_c$. Which of the following frequency is not contained in the modulated wave [2017]
- (a) $\omega_c - \omega_m$ (b) ω_m
 (c) ω_c (d) $\omega_m + \omega_c$
7. 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) 2×10^5 (b) 2×10^6
 (c) 2×10^3 (d) 2×10^4

2. IIT-JEE/AIEEE

1. A signal of 5 kHz frequency is amplitude modulated on a carrier wave of frequency 2 MHz. The frequencies of the resultant signal is/are [2015]
- (a) 2 MHz only
 (b) 2005 kHz and 1995 kHz
 (c) 2005 kHz, 2000 kHz and 1995 kHz
 (d) 2000 kHz and 1995 kHz

27. Communication – Answers Keys

1. Communication

1	a	2	b	3	a	4	a	5	b
6	b	7	d	8	a	9	a	10	b
11	c	12	b	13	c	14	c	15	a
16	a	17	d	18	a	19	a	20	c
21	e	22	a	23	c	24	c	25	b
26	c	27	d	28	b	29	d	30	c
31	b	32	c	33	b	34	c	35	b
36	b	37	d	38	b	39	b	40	b
41	c	42	d	43	d	44	b	45	c
46	b	47	c	48	c				

2. IIT-JEE/AIEEE

1	c	2	a	3	b	4	c	5	d
6	b	7	a						