SOLVED EXAMPLES

Ex.1 What is the modulation index of an over modulated wave

    (1) 1   **(2)** zero   **(3)** < 1   **(4)** > 1

Sol.   **(4)** When $m_a > 1$ then carrier is said to be over modulated.

Ex.2 Which of the following is the disadvantage of FM over AM

    (1) Larger band width requirement   **(2)** Larger noise

    (3) Higher modulation power   **(4)** Low efficiency

Sol.   **(1)** Frequency modulation requires much wider channel (7 to 15 times) as compared to AM.

Ex.3 When the modulating frequency is doubled, the modulation index is halved and the modulating voltage constant the modulation system is

    (1) Amplitude modulation   **(2)** Phase modulation   **(3)** Frequency modulation   **(4)** All of the above

Sol.   **(3)**

Ex.4 Indicate which one of the following system is digital

    (1) Pulse position modulation   **(2)** Pulse code modulation

    (3) Pulse width modulation   **(4)** Pulse amplitude modulation

Sol.   **(2)**

Ex.5 In an FM system a 7 kHz signal modulates 108 MHz carrier so that frequency deviation is 50 kHz. The carrier swing is

    (1) 7.143   **(2)** 8   **(3)** 0.71   **(4)** 350

Sol.   **(1)**

Ex.6 Sinusoidal carrier voltage of frequency 1.5 MHz and amplitude 50 V is amplitude modulated by sinusiodal voltage of frequency 10 kHz producing 50% modulation. The lower and upper side-band frequencies in kHz are

    (1) 1490, 1510   **(2)** 1510, 1490   **(3)** $\dfrac{1}{1490}, \dfrac{1}{1510}$ **(4)** $\dfrac{1}{1510}, \dfrac{1}{1490}$

Sol.   **(1)** Here, $f_c = 1.5\,\text{MHz} = 1500\,\text{kHz}$, $f_m = 10\,\text{kHz}$

    $\therefore$ Lower side band frequency

    $= f_c = f_m = 1500\,\text{kHz} - 10\,\text{kHz} = 1490\,\text{kHz}$

    Upper side band frequency

    $= f_c + f_m = 1500\,\text{kHz} + 10\,\text{kHz} = 1510\,\text{kHz}$

Ex.7 If f_0 and f_f represent the carrier wave frequencies for amplitude and frequency modulations respectively, then

    (1) $f_0 > f_f$ **(2)** $f_0 < f_f$ **(3)** $f_0 = f_f$ **(4)** $f_0 \geq f_f$

Sol.   **(2)**

Ex.8 The frequency of a FM transmitter without signal input is called

    (1) Lower side band frequency   **(2)** Upper side band frequency

    (3) Resting frequency   **(4)** None of these

Sol.   **(3)**

Ex.9 What type of modulation is employed in India for radio transmission

    (1) Amplitude modulation   **(2)** Frequency modulation   **(3)** Pulse modulation   **(4)** None of these

Sol.   **(1)**

Ex.10 While tuning in a certain broadcast station with a receiver, we are actually

    (1) Varying the local oscillator frequency   **(2)** Varying the frequency of the radio signal to be picked up

    (3) Tuning the antenna   **(4)** None of these

Sol.   **(1)**

Exercise # 1   [Single Correct Choice Type Questions]

1. A digital signal –
    (A) is less reliable than analog signal   **(B)** is more reliable than analog signal
    (C) is equally reliable as the analog signal   **(D)** none of the above

2. Modern communication systems use :
    (A) analog circuits   **(B)** digital circuits
    (C) combination of analog and digital circuits   **(D)** none of the above

3. The audio signal -
    (A) can be sent directly over the air for large distance
    (B) cannot be sent directly over the air for large distance
    (C) possess very high frequency
    (D) none of the above

4. The process of changing some characteristic of a carrier wave in accordance with the intensity of the signal is called -
    (A) amplification   **(B)** rectification   **(C)** modulation   **(D)** none of these

5. If a carrier wave of 1000 kHz is used to carry the signal, the length of transmitting antenna will be equal to-
    (A) 3 m   **(B)** 30 m   **(C)** 300 m   **(D)** 3000 m

6. The types of modulation which are possible, are -
    (A) one only   **(B)** two only   **(C)** three only   **(D)** none of these

7. In amplitude modulation -
    (A) only the amplitude is changed but frequency remains same
    (B) both the amplitude and frequency change equally
    (C) both the amplitude and frequency change unequally
    (D) none the these

8. Modulation factor determines -
    (A) only the strength of the transmitted signal   **(B)** only the quality of the transmitted signal
    (C) both the strength and quality of the signal   **(D)** none of the above

9. Degree of modulation –
    (A) can take any value   **(B)** should be less than 100%
    (C) should exceed 100%   **(D)** none of these

10. If the maximum and minimum voltage of an AM wave are $V_{max.}$ and $V_{min.}$ respectively then modulation factor–

    (A) $m = \dfrac{V_{max.}}{V_{max.} + V_{min.}}$ **(B)** $m = \dfrac{V_{min.}}{V_{max.} + V_{min.}}$ **(C)** $m = \dfrac{V_{max.} + V_{min.}}{V_{max.} - V_{min.}}$ **(D)** $m = \dfrac{V_{max.} - V_{min.}}{V_{max.} + V_{min.}}$

11. The AM wave contains three frequencies, viz :

    (A) $\dfrac{f_c}{2}, \dfrac{f_c + f_s}{2}, \dfrac{f_c - f_s}{2}$ **(B)** $2f_c, 2(f_c + f_s), 2(f_c - f_s)$

    (C) $f_c, (f_c + f_s), (f_c - f_s)$ **(D)** f_c, f_c, f_c

12. In AM wave, carrier power is given by -

   (A) $P_c = \dfrac{2E_c^2}{R}$ 　　　 (B) $P_C = \dfrac{E_c^2}{R}$ 　　　 (C) $P_C = \dfrac{E_c^2}{2R}$ 　　　 (D) $P_C = \dfrac{E_c^2}{\sqrt{2}\,R}$

13. Fraction of total power carried by side bands is given by -

   (A) $\dfrac{P_s}{P_T} = m^2$ 　　 (B) $\dfrac{P_s}{P_T} = \dfrac{1}{m^2}$ 　　 (C) $\dfrac{P_s}{P_T} = \dfrac{2 + m^2}{m^2}$ 　　 (D) $\dfrac{P_s}{P_T} = \dfrac{m^2}{2 + m^2}$

14. Which of the following is/are the limitations of amplitude modulation?
   (A) Clear reception　　(B) High efficiency　　(C) Small operating range (D) Good audio quality

15. What is the frequency above which radiation of electrical energy is parctical ?
   (A) 0.2 kHz　　(B) 2kHz　　(C) 20 kHz　　(D) 200kHz

16. What type of modulation is employed in India for radio transmission?
   (A) Pulse modulation 　　　　　　　(B) Frequency modulation
   (C) Amplitude modulation 　　　　　(D) None of these

17. For a carrier frequency of 100 kHz and a modulating frequency of 5 kHz what is the width of AM transmission–
   (A) 5 kHz　　(B) 10kHz　　(C) 20 kHz　　(D) 200 KHz

18. Which one of the following subsystems is used for satellite's orbit position and altitude?
   (A) Thrust subsystem　　(B) Power subsystem　　(C) Antenna subsystem (D) Stabilization subsystem

19. Intelsat satellite works as a:
   (A) transmitter　　(B) repeater　　(C) absorber　　(D) none of these

20. Intelsat satellite is used for :
   (A) radio communication 　　　　　(B) intercontinental communication
   (C) radar communication 　　　　　(D) none of the above

21. A geo-synchronous satellite is :
   (A) located at a height of 35,860 km to ensure global coverage
   (B) appears stationary over the earth's magnetic pole
   (C) not really stationary at all, but orbits the earth within 24 hrs
   (D) motionless in space (except for its spin)

22. The frequency band used for radar relay systems and television -
   (A) UHF　　(B) VLF　　(C) VHF　　(D) EHF

23. Fading applies to :
   (A) troposcatter propagation 　　　(B) ionospheric propagation
   (C) Faraday rotation 　　　　　　　(D) atmospheric storms

24. When microwave signals follow the curvature of earth, this is known as :
   (A) window 　　　　　　　　　　　　(B) the Faraday effect
   (C) ionospheric reflection 　　　　　(D) ducting

25. In which of the region of earth's atmosphere temperature decreases with height?
   (A) Ionosphere　　(B) Stratosphere　　(C) Troposphere　　(D) Mesosphere

26. Major parts of a communications systems are :
(A) transmitter and receiver
(B) receiver and communication channel
(C) transmitter and communication channel
(D) transmitter, receiver and communication channel

27. Communication channel consist of :
(A) transmission line
(B) optical fibre
(C) free space
(D) all of the above

28. 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

29. The message signal can be :
(A) analog only
(B) digital only
(C) analog and digital
(D) analog or digital

30. A microphone converts
(A) sound signals into electrical signals
(B) electrical signals into sound signals
(C) both (A) and (B) above
(D) neither (A) nor (B)

31. A loud speaker converts
(A) electrical signals into sound signals
(B) sound signals into electrical signals
(C) both (A) and (B) above
(D) neither (A) nor (B)

32. Which is more advantageous ? (i) analog data communication (ii) digital data communication ?
(A) analog data communication
(B) digital data communication
(C) both are equally good
(D) depends on the situation

33. The message signal is usually of :
(A) audio frequency range
(B) radio frequency range
(C) audio or radio frequency range
(D) mixture of both

34. Modulation is the phenomenon of :
(A) superimposing the audio frequency signal over a carrier wave
(B) separting the audio frequency signal from the carrier wave
(C) separating carrier wave from the modulated wave
(D) any of (A),(B),(C) above

35. In amplitude modulation, carrier wave frequencies are :
(A) lower compared to those in frequency modulation
(B) higher compared to those in frequency modulation
(C) same as in frequency modulation
(D) lower sometimes and higher sometimes to those in frequency modulation

36. The transmission media can be :
(A) guided only
(B) unguided only
(C) both (A) and (B)
(D) neither (A) nor (B)

37. A 1000 kHz carrier is modulated with 800 Hz audio signals. What are the frequencies of first pair of side bands :
(A) 1000.8 kHz, 999.2 kHz
(B) 999.2 kHz, 998.4 kHz
(C) 1001.6 kHz, 1000.8 kHz
(D) 1000 kHz, 800 Hz

38. In an amplitude modulated wave, for audio frequency of 500 cps, the appropriate carrier frequency will be :
(A) 50 c/s   (B) 100 c/s   (C) 500 c/s   (D) 50000 c/s

39. In A.M., the total modulation index should not exceed one or else :
(A) the system will fail   (B) distortion will result
(C) amplifier will be damaged   (D) none of the above

40. Polarization in electromagnetic wave is caused by -
(A) reflection   (B) refraction
(C) transverse nature of e.m. waves   (D) longitudinal nature of e.m. waves

41. The velocity of electromagnetic waves in a dielectric medium ($\in_r = 4$) is -
(A) 3×10^8 metre/second   (B) 1.5×10^8 metre/second
(C) 6×10^8 metre/second   (D) 7.5×10^7 metre/second

42. An 'antenna' is
(A) inductive   (B) capacitive
(C) resistive above its resonance frequency   (D) none of the above

43. The characteristic impedance of a loss less transmission line is given by -
(A) $Z_0 = \sqrt{LC}$ (B) $Z_0 = \sqrt{L/C}$ (C) $Z_0 = \sqrt{C/L}$ (D) $Z_0 = LC$

44. The Q of a resonant transimission line is :
(A) $Q = \dfrac{\omega}{LR}$ (B) $Q = \dfrac{\omega R}{L}$ (C) $Q = \dfrac{L}{R}$ (D) $Q = \dfrac{\omega L}{R}$

45. The distance between consecutive maxima and minima is given by -
(A) $\lambda/2$ (B) 2λ (C) λ (D) $\lambda/4$

Exercise # 2 — Part # I — [Multiple Correct Choice Type Questions]

1. Through which mode of propagation, the radiowaves can be sent from one place to another -
(A) Ground wave propagation
(B) Sky wave propagation
(C) Space wave propagation
(D) All of them

2. The frequencies of electromagnetic waves employed in space communication vary over a range of -
(A) 10^4 Hz to 10^7 Hz
(B) 10^4 Hz to 10^{11} Hz
(C) 1 Hz to 10^4 Hz
(D) 1 Hz to 10^{11} Hz

3. The wavelength of electromagnetic waves employed for space communication lie in the range of-
(A) 1 mm to 30 m
(B) 1mm to 300 m
(C) 1 mm to 3 km
(D) 1 mm to 30 km

4. The radiowaves of frequency 300 MHz to 3000 MHz belongs to -
(A) High frequency band
(B) Very high frequency band
(C) Ultra high frequency band
(D) Super high frequency band

5. The maximum range of ground or surface wave propagation depends on -
(A) the frequency of the radiowaves only
(B) power of the transmitter only
(C) both of them
(D) none of them

6. In which frequencies range space waves are normally propagated -
(A) HF
(B) VHF
(C) UHF
(D) SHF

7. For television broadcasting, the frequency employed is normally -
(A) 30 - 300 M Hz
(B) 30 - 300 G Hz
(C) 30 - 300 K Hz
(D) 30 - 300 Hz

8. The sound waves after being converted into electrical waves are not transmitted as such because -
(A) they travel with the speed of sound
(B) the frequency is not constant
(C) they are heavily absorbed by the atmosphere
(D) the height of antenna has to be increased several times

9. 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

10. In an amplitude modulated wave for audio frequency of 500 cycles/second, the appropriate carrier frequency will be -
(A) 50 cycles/sec
(B) 100 cycles/sec
(C) 500 cycles/sec
(D) 50,000 cycles/sec

11. The TV. transmission tower in Delhi has a height of 240 m. The distance up to which the broadca~t can be received, (taking the radius of earth to be 6.4 x 10^6 m) is -
(A) 100 km
(B) 60 km
(C) 55. km
(D) 50 km

12. Radio waves of constant amplitude can be generated with -
(A) Filter
(B) Rectifier
(C) FET
(D) Oscillator

13. Range of frequencies allotted for commercial FM radio broadcast is -
(A) 88 to 108 MHz
(B) 88 to 108 kHz
(C) 8 to 88 MHz
(D) 88 to 108 GHz

14. Intelset satellite works as a -
(A) transmitter
(B) receiver
(C) absorber
(D) repeater

15. The space waves which are affected seriously by atmospheric conditions are -
(A) MF   (B) HF   (C) VHF   (D) UHF

16. A sky wave with a frequency 55 MHz is incident on D-region of earth's atmosphere at 45°. The angle of refraction is (electron density for D-region is 400 electron/cc.) -
(A) 60°   (B) 45°   (C) 30°   (D) 15°

17. A TV. tower has a height 150 m. What is the population density around the TV. tower if the total population covered is 50 lakh ? (Radius of earth = 6.4×10^6 m)
(A) 82.6 km^{-2} (B) 800.6 km^{-2} (C) 828.6 km^{-2} (D) 876.6 km^{-2}

18. Calculate the phase velocity of electromagnetic wave having electron density and frequency for D layer, N = 400 electron/ cc, ν = 300 kHz -
(A) 3×10^8 m/s   (B) 3.75×10^8 m/s   (C) 6.8×10^8 m/s   (D) 1.1×10^9 m/s

19. Which of the following is not transducer?
(A) Loudspeaker   (B) Amplifier   (C) Microphone   (D) All of these

20. 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

21. The velocity factor of a transmission line x, if dielectric constant of the medium is 2.6, the value of x is
(A) 0.26   (B) 0.62   (C) 2.6   (D) 6.2

22. Long distance short wave radio broadcasting uses
(A) Ground wave   (B) Ionospheric wave   (C) Direct wave   (D) Sky wave

23. In short wave communication waves of which of the following frequencies will be reflected back by the ionospheric layer, having electron density 10^{11} per m^3
(A) 2 MHz   (B) 10 MHz   (C) 12 MHz   (D) 18 MHz

24. The characteristic impedance of a coaxial cable is of the order of
(A) 50 Ω (B) 200 Ω (C) 270 Ω (D) None of these

25. A laser beam of pulse power 10^{12} watt is focussed on an object are 10^{-4} cm^2. The energy flux in watt/cm^2 at the point of focus is
(A) 10^{20} (B) 10^{16} (C) 10^8 (D) 10^4

26. The carrier frequency generated by a tank ciruit containing 1 nF. capacitor and 10 μH inductor is
(A) 1592 Hz   (B) 1592 MHz   (C) 1592 kHz   (D) 159.2 Hz

27. Broadcasting antennas are generally
(A) Omnidirectional type   (B) Vertical type
(C) Horizontal type   (D) None of these

28. The attenuation in optical fibre is mainly due to
(A) Absorption   (B) Scattering
(C) Neither absorption nor scattering   (D) Both (A) and (B)

29. The maximum distance upto which TV transmission from a TV tower of height h can be received is proportional to
(A) $h^{1/2}$ (B) h   (C) $h^{3/2}$ (D) h^2

30. A laser beam is used for carrying out surgery because it
(A) Is highly monochromatic   (B) Is highly coherent
(C) Is highly directional   (D) Can be sharply focussed

31. 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.

32. Range of frequencies allotted for commercial FM radio broadcast is
(A) 88 to 108 MHz   (B) 88 to 108 MHz   (C) 8 to 88 MHz   (D) 88 to 108 GHz

33. A step index fibre has a relative refractive index of 0.88% What is the critical angle at the corecladding interface $(\sin 84^o24' = 0.9912)$
(A) 60º   (B) 75º   (C) 45º   (D) None of these

34. In which frequency range, space waves are normally propagated
(A) HF   (B) VHF   (C) UHF   (D) SHF

35. If μ_1 and μ_2 are the refractive indices of the materials of core and cladding of an optical fibre, then the loss of light due to its leakage can be minimised by haveing
(A) $\mu_1 > \mu_2$ (B) $\mu_1 < \mu_2$ (C) $\mu_1 = \mu_2$ (D) None of these

36. Through which mode of propagnation, the radio waves can be sent from one place to another. **[JIPMER 2003]**
(A) Ground wave propagation   (B) Sky wave propagation
(C) Space wave propagation   (D) All of them

37. For television broadcasting, the frequency employed is normally
(A) 30-300 MHz   (B) 30-300 GHz   (C) 30-300 kHz   (D) 30-300 Hz

38. The radio waves of frequency 300 MHz to 3000 MHz belong to
(A) High frequency band   (B) Very high frequency band
(C) Ultra high frequency band   (D) Super high frequency band

39. An antenna behaves as resonant circuit only when its length is
(A) $\dfrac{\lambda}{2}$ (B) $\dfrac{\lambda}{4}$
(C) λ (D) $\dfrac{\lambda}{2}$ or integral multiple of $\dfrac{\lambda}{2}$

40. Maximum useable frequency (MUF) in F-region layer is x, when the critical frequency is 60 MHz and the angle of incidence is 70º. Then x is
(A) 150 MHz   (B) 170 MHz   (C) 175 MHz   (D) 190 MHz

41. The electromagnetic waves of frequency 2 MHz to 30 MHz are
(A) In ground wave propagation   (B) In sky wave propagation
(C) In microwave propagation   (D) In satellite communication

42. A laser is a coherent source because it contains
(A) Many wavelengths
(B) Uncoordinated wave of a particular wavelength
(C) Coordinated wave of many wavelengths
(D) Coordinated waves of a particular wavelength

43. Laser beams are used to measure long distances because
(A) They are monochromatic   (B) They are highly polarised
(C) They are coherent   (D) They have high degree of parallelism

44. An oscillator is producing FM waves of frequency 2 kHz with a variation of 10 kHz. What is the modulating index
(A) 0.20   (B) 5.0   (C) 0.67   (D) 1.5

45. The phenomenon by which light travels in an optical fibres is :
(A) Reflection
(B) Refraction
(C) Total internal reflection
(D) Transmisssion

46. 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

47. Advantage of optical fibre
(A) High bandwidth and EM interference
(B) Low bandwidth and EM interference
(C) High band width, low transmission capacity and no EM interference
(D) High bandwidth, high data transmission capacity and no EM interference

Part # II ▸▸ [Assertion & Reason Type Questions]

In each of the following questions, a statement of Assertion (A) is given followed by a corresponding statement of Reason (R) just below it . Of the statements mark the correct answer as
(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1
(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(C) Statement-1 is True, Statement-2 is False
(D) Statement-1 is False, Statement-2 is True.

1. **Statement -1 :** The electrical conuctivity of earth's atmosphere increases with altitude.
Statement - 2 : The high energy particles (i.e., γ-rays and cosmic rays) coming from outer space while enetr ing our earth's atmosphere cause ionization of the atoms of the gases present in the atmosphere and their energy decreases as they approach to earth.'

2. **Statement - 1 :** In a diode AM detector, R = 1 kΩ and C = 10 pF circuit is good enough to detect a carrier signal of 100 kHz.

Statement - 2 : The condition $\dfrac{1}{f_c} << RC$.

3. **Statement–1:** Surface wave and sky wave can not be observed on moon.
Statement–2: Atmosphere of variable refractive index is require for propagation of surface & sky wave.

4. **Statement–1:** Diode lasers are used as optical sources in optical communication.
Statement–2: Diode lasers consume less energy.

5. **Statement–1:** Television signals are received through skywave propagation.
Statement–2: The ionosphere reflects electromagnetic waves of frequencies greater than a certain critical frequency.

6. **Statement–1:** In high latitude one sees colourful curtains of light hanging down from high altitudes.
Statement–2: The high energy charged particles from the sun are deflected to polar regions by the magnetic field of the earth.

7. **Statement–1:** Short wave bands are used for transmission of radio waves to a large distance.
Statement–2: Short waves are reflected by ionosphere.

Exercise # 3   Part # I   [Previous Year Questions] [AIEEE/JEE-MAIN]

1. Consider telecommunication through optical fibres. Which of the following statements is not true   **[AIEEE 2003]**
   (1) Optical fibres may have homogeneous core with a suitable cladding
   (2) Optical fibres can be of graded refractive index
   (3) Optical fibres are subject to electromagnetic interference from outside
   (4) Optical fibres have extremely low transmission loss

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.   **[AIEEE - 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.
   (1) Statement –1 is true, statement –2 is false.
   (2) Statement –1 is true, Statement –2 is true, Statement –2 is the correct explanation of Statement –1
   (3) Statement –1 is true, Statement –2 is true, Statement –2 is not the correct explanation of Statement–1
   (4) Statement–1 is false, Statement –2 is true

3. Which of the following four alternatives is not correct?   **[AIEEE 2011]**
   We need modulation:
   (1) to reduce the time lag between transmission and reception of the information signal
   (2) to reduce the size of antenna
   (3) to reduce the e fractional band width, that is the ratio of the signal band width to the centre frequency
   (4) to increase the selectivity.

4. A radar has a power of 1kW 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 $= 6.4 \times 10^6$ m) is :   **[AIEEE - 2012]**
   (1) 80 km   **(2)** 16 km   **(3)** 40 km   **(4)** 64 km

5. 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.   **[JEE-MAIN 2013]**
   (1) 10.62 MHz   **(2)** 10.62 kHz   **(3)** 5.31 MHz   **(4)** 5.31 kHz

6. 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 :   **[JEE-Main 2015]**
   (1) 2005 kHz, 2000 kHz and 1995 kHz
   (2) 2000 kHz and 1995 kHz
   (3) 2 MHz only
   (4) 2005 kHz and 1995 kHz

7. Choose the correct statement: **[JEE-Main 2016]**
   (1) In amplitude modulation the frequency of the high frequency carrier wave is made to vary in proportion to the amplitude of the audio signal.
   (2) In frequency modulation the amplitude of the high frequency carrier wave is made to vary in proportion to the amplitude of the audio signal.
   (3) In frequency modulation the amplitude of the high frequency carrier wave is made to vary in proportion to the frequency of the audio signal.
   (4) In amplitude modulation the amplitude of the high frequency carrier wave is made to vary in proportion to the amplitude of the audio signal.

ANSWER KEY

EXERCISE - 1

1. B **2.** B **3.** B **4.** C **5.** C **6.** C **7.** A **8.** C **9.** B **10.** D **11.** C **12.** C **13.** D
14. C **15.** C **16.** C **17.** B **18.** A **19.** B **20.** B **21.** C **22.** A **23.** A **24.** D **25.** C **26.** D
27. D **28.** D **29.** D **30.** A **31.** A **32.** B **33.** A **34.** A **35.** A **36.** C **37.** A **38.** D **39.** B
40. C **41.** D **42.** A **43.** B **44.** C **45.** D

EXERCISE - 2 : PART # I

1. D **2.** B **3.** D **4.** C **5.** C **6.** C **7.** A
8. C **9.** C **10.** D **11.** C **12.** D **13.** A **14.** D **15.** D **16.** B **17.** C **18.** B **19.** B **20.** C
21. B **22.** C **23.** A **24.** C **25.** B **26.** C **27.** B **28.** D **29.** A **30.** D **31.** C **32.** A **33.** D
34. C **35.** A **36.** D **37.** A **38.** C **39.** D **40.** C **41.** B **42.** D **43.** D **44.** B **45.** C **46.** D
47. D

PART # II

1. A **2.** D **3.** A **4.** A **5.** D **6.** C **7.** A

EXERCISE - 3 : PART # I

1. 3 **2.** 4 **3.** 1 **4.** 1 **5.** 2 **6.** 1 **7.** 4