QB365

Important Questions - Communication Systems

12th Standard CBSE

Physics

Reg.No. : | | | | | | |

Time : 01:00:00 Hrs

Total Marks : 50

1) 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: **1**

(a) A is transmitted via space 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 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.

2) A 100m long antenna is mounted on a 500 m tall building. The complex can become a transmission tower for waves with λ. **1**

(a) $\sim$ 400 m (b) $\sim$ 25 m (c) $\sim$ 150 m (d) $\sim$ 2400 m

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

$[gain \quad in \quad dB = 10\log\left(\frac{P_0}{P_i}\right)]$

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

4) A speech signal of 3kHz is used to modulate a carrier signal of frequency 1MHz, using amplitude modulation.The frequencies of the sidebands will be **1**

(a) 1.003 MHz and 0.997 MHz (b) 3001 kHz and 2997 kHz (c) 1003 kHz and 1000 kHz

(d) 1 MHz and 0.997 MHz

5) A TV transmission tower has a height of 240 m.Signals broadcast from this tower will be received by LOS communication at a distance of(assume the radius of earth to be $6.4 \times 10^6 m$) **1**

(a) 100 km (b) 24 km (c) 55 km (d) 50 km

6) Out of the following, which is not an essential element of a communication system? **1**

(a) Transmitter (b) Transducer (c) Receiver (d) Communication Channel

7) What do you understand by AM range of radio communication? Can these waves pass through atmosphere? **2**

8) Explain the "green house effect" of earth's atmosphere. **2**

9) On what factors does the maximum range of ground wave propagation depend? How can the maximum range on ground wave propagation be increased? **2**

10) Why cannot the (i) ground waves (ii) space waves and (ii)sky waves be sustained for long distance communication system beyond 10 MH to 20 MHz **2**

11) Is it necessary to use satellite for long distance T.V. transmission ? Give reason. 2

12) Sky waves are not used in transmitting T.V. signals. Why? State two factors by which the range of transmision of T.V .signals can be increased. 2

13) A carrier of 200 V and 1.2 MHz is modulated by a 100 V, 1 MHz sine wave signal.Find the modulation factor. 3

14) An audio signal of amplitude one half the carrier amplitude is employed in amplitude modulation.What is modulation index? 3

15) The length of Marconi antenna at a place is 0.75 m.What is the optimum transmission frequency? 3

16) Calculate the length of quarter wave antenna for transmission frequency of 20 MHz 3

17) Calculate the length of half wave dipole antenna at (a) 30 MHz (b) 300 MHz (c) 3000 MHz. What inference do you draw from these results? 5

18) What is the length of Marconi antenna for a transmission frequency of 15 MHz? 5

19) The length of Marconi antenna at a place is 1.5 m. What is the optimum transmission frequency? 5

20) A modulated carrier wave has maximum and minimum amplitudes of 800 mV and 200 mV. What is the percentage modulation? 5

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1) (b) A is transmitted via ground wave, B via sky wave and C via space wave. 1

2) (a) ~ 400 m 1

3) (b) 100 W 1

4) (a) 1.003 MHz and 0.997 MHz 1

5) (c) 55 km 1

6) (b) Transducer 1

7) 2

The electromagnetic waves of frequency less than 30 MHz (or wavelength 10 m or more) form amplitude modulated range (i.e. A>M range) These waves atmosphere of the earth.But these waves are reflected back by the topmost layer of the atmosphere ,the ionosphere

8) 2

Our earth's atmosphere is transparent to the visibleradiations coming from sun,stars etc. but reflects back the infrared radiations and hence it does not allow the infrared radiations since the earth gets heated to much lower temperature than the temperature of sun,the radiations emitted by earth arew mostly in the infrared region,according to Planck's law.These radiations emitted by earth are reflected back by earth's atmosphere Due to ot,the earth's surface remains warm at night.This phenomenon is called Green House effect.

9) 2

The maximum range of ground wave propagation depends upon (i) the frequency of wave (ii) the power of the transmitter.

The maximum range of ground wave propagation can be increased by increasing the power of transmitter which is so onlyfor very low frequency band(VLF) and not for medium frequency band (MF).

10) **2**

(i) In ground wave propagation,the conduction losses due to ground are very high at higher frequencies. (ii) The space wave propagation has a limited line of sight distance due to curvature of earth (iii) At frequencies beyond 30 MHz,the sky waves pass through the ionosphere and are not reflected back.

11) **2**

The T.V transmission involves the television signal waves having the frequency range 54 MHz to 890 MHz.These waves neither follow the curvature of earth nor they get reflected by ionosphere.Therefore,their communication via ground wave or sky wave is not possible. The reception of television signals is possible either (i) by using communication geostationary satellite which reflects the television signals back to earth or (ii) by using tall receiver antenna which may directly intercept the signals.

12) **2**

T.V signals have frequency range of 54 MHz to 890 MHz.They can not be reflected by ionosphere rather they pass through the ionosphere.That is why the transmission of T.V. signals is not possible via sky wave. The range of T.V. transmission can be increased by using (i) tall antenna at transmitting station and receiving station and (ii) geostationary satellite.

13) Modulation factor, $m_a = \frac{E_s}{E_m} = \frac{100\ V}{200\ V} = 0.5$ **3**

14) **3**

$m_a = \frac{E_{max} - E_{min}}{E_{max} + E_{min}} Here \quad E_{max} = E_c + 0.5E_c = 1.5E_c \qquad E_{min} = E_c - 0.5E_c = 0.5E_c \therefore \qquad m_a = \frac{1.5E_c - 0.5E_c}{1.5E_c + 0.5E_c} = 0.5$

15) **100 MHz** Here, $i = 0.75 \quad m, v = ?$ **3**

As $\frac{\lambda}{4} = l \quad \therefore = 4l = 4 * 0.75m = 3.0mv = \frac{c}{\lambda} = \frac{3 * 10^8}{3.0} = 10^8 Hz = 10^2 MHz$

16) **3**

3.75 m $l = \frac{\lambda}{4} = \frac{1}{4}\left(\frac{c}{v}\right) = \frac{1}{4} * \left(\frac{3 * 10^8}{20 * 10^6}\right) = 3.75 \quad m$

17) (a) v = 30 MHz = 30 x 10^6 Hz **5**

$\lambda = \frac{c}{v} = \frac{3 \times 10^8}{30 \times 10^6} = 10m$

$l = \frac{\lambda}{2} = \frac{10}{2} = 5m$

(b) v = 300 MHz = 300 x 10^6 Hz

= 3 x 10^8 Hz

$l = \frac{\lambda}{2} = \frac{1}{2}\left(\frac{c}{v}\right) = \frac{1}{2}\left(\frac{3 \times 10^8}{3 \times 10^8}\right) = 0.5m$

(c) v = 3000 MHz = 3000 x 10^6 Hz

= 3 x 10^9 Hz

$l = \frac{\lambda}{2} = \frac{1}{2}\left(\frac{c}{v}\right) = \frac{1}{2}\left(\frac{3 \times 10^8}{3 \times 10^9}\right) = 0.05m$

18) Here, l = 1? **5**

v = 15 MHz = 15 x 10^6 Hz

$$\lambda = \frac{c}{v} = \frac{3\times10^8}{15\times10^6} = 20 \quad m$$

Length of Marconi antenna,

$$l = \frac{\lambda}{4} = \frac{20}{4} = 5 \quad m$$

19) Here, $l = \frac{\lambda}{4} = 1.5m$ **5**

$$\therefore \quad \lambda = 4 \times 1.5 = 6m$$

$$v = \frac{c}{\lambda} = \frac{3\times10^8}{6} = 5 \times 10^7 Hz = 50MHz$$

20) Here, A_{max} = 800 mV. **5**

A_{min} = 200 mV

$$\mu_a = \frac{A_{max}-A_{min}}{A_{max}+A_{min}} = \frac{(800-200)}{(800+200)} \text{ x } 100\%$$

= 60 %.