EXERCISE-I

1. 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 having

(A) $\mu_1 > \mu_2$ (B) $\mu_1 < \mu_2$

(C)
$$\mu_1 = \mu_2$$
 (D) None of these

- 2. Through which mode of propagation, the radio waves can be sent from one place to another
 - (A) Ground wave propagation
 - (B) Sky wave propagation
 - (C) Space wave propagation
 - (D) All of them
- 3. A laser beam of pulse power 10^{12} watt is focused on an object are 10^{-4} cm². The energy flux in watt/ cm² at the point of focus is
 - (A) 10^{20} (B) 10^{16} (C) 10^8 (D) 10^4
- 4. The carrier frequency generated by a tank circuit containing 1 *nF* capacitor and 10 μH inductor is
 - (A) 1592 *Hz* (B) 1592 *MHz* (C) 1592 *HH*
 - (C) 1592 *kHz* (D) 159.2 *Hz*
- 5. Broadcasting antennas are generally (A) Omnidirectional type
 - (B) Vertical type
 - (C) Horizontal type
 - (D) None of these
- 6. 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

- 7. 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
- 8. 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
- 9. Audio signal cannot be transmitted because
 - (A) The signal has more noise
 - (B) The signal cannot be amplified for distance communication
 - (C) The transmitting antenna length is very small to design
 - (D)The transmitting antenna length is very large and impracticable
- **10.** In which of the following remote sensing technique is not used
 - (A) Forest density
 - (B) Pollution
 - (C) Wetland mapping
 - (D) Medical treatment
- 11. If f_a and f_f represent the carrier wave frequencies for amplitude and frequency modulations respectively, then
 - (A) $f_a > f_f$ (B) $f_a < f_f$
 - (C) $f_a \approx f_f$ (D) $f_a \ge f_f$

for

bandwidth

allotted

(B) 88 to 108 kHz

(C) 8 to 88 *MHz* (D) 88 to 108 *GHz*

frequencies

- **20.** 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

18. AM is used for broadcasting because

modulation systems

provide

19. Range

(A)It is more noise immune than other

(B) It requires less transmitting power

(D)No other modulation system can

necessary

compared with other systems (C) Its use avoids receiver complexity

the

commercial FM radio broadcast is

faithful transmission

of

(A) 88 to 108 MHz

- **21.** For television broadcasting, the frequency employed is normally
 - (A) 30-300 *MHz* (B) 30-300 *GHz*
 - (C) 30-300 KHz (D) 30-300 Hz
- **22.** 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
- **23.** An antenna behaves as resonant circuit only when its length is

(A)
$$\frac{\lambda}{2}$$

(B) $\frac{\lambda}{4}$
(C) λ
(D) $\frac{\lambda}{2}$ or integral multiple of $\frac{\lambda}{2}$

- **12.** Which of the following is the disadvantage of FM over AM
 - (A) Larger band width requirement
 - (B) Larger noise
 - (C) Higher modulation power
 - (D) Low efficiency
- 13. If a number of sine waves with modulation indices n_1 , n_2 , n_3 modulate a carrier wave, then total modulation index (n) of the wave is

(A)
$$n_1 + n_2 \dots + 2(n_1 + n_2 \dots)$$

(B)
$$\sqrt{n_1 - n_2 + n_3 \dots n_2}$$

(C)
$$\sqrt{n_1^2 + n_2^2 + n_3^2}$$
.....

- (D) None of these
- 14. An AM wave has 1800 *watt* of total power content, For 100% modulation the carrier should have power content equal to
 - (A) 1000 *watt* (B) 1200 *watt*
 - (C) 1500 *watt* (D) 1600 *watt*
- **15.** The frequency of a FM transmitter without signal input is called
 - (A) Lower side band frequency
 - (B) Upper side band frequency
 - (C) Resting frequency
 - (D) None of these
- 16. 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*
- 17. In an amplitude modulated wave for audio frequency of 500 *cycle/second*, the appropriate carrier frequency will be
 - (A) 50 cycles/sec
 - (B) 100 cycles/sec
 - (C) 500 cycles/sec
 - (D) 50,000 cycles/sec

Communication system

Communication system

- 24. Maximum useable frequency (MUF) in Fregion 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
- **25.** 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
- 26. A laser is a coherent source because it contains
 - (A) Many wavelengths
 - (B) Uncoordinated wave of a particular wavelength
 - (C) Coordinated of wave many wavelengths
 - (D) Coordinated waves of a particular wavelength
- 27. The attenuation in optical fibre is mainly due to
 - (A) Absorption
 - (B) Scattering
 - (C) Neither absorption nor scattering
 - (D) Both (A) and (B)
- 28. The maximum distance upto which TV transmission from a TV tower of height hcan be received is proportional to

(A) $h^{1/2}$ $(\mathbf{B})h$ (C) $h^{3/2}$ (D) h^{2}

- 29. 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

30. 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 **31.** 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 **32.** Long distance short-wave radio broadcasting uses (A) Ground wave (B) Ionospheric wave (C) Direct wave (D) Sky wave **33.** A step index fibre has a relative refractive index of 0.88%. What is the critical angle at the corecladding interface (A) 60° (B) 75° (C) 45° (D)None of these **34.** 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 **35.** In which frequency range, space waves are normally propagated (A) HF (B) VHF (C) UHF (D) SHF 36. What type of modulation is employed in India for radio transmission (A) Amplitude modulation (B) Frequency modulation (C) Pulse modulation (D) None of these

Communication system

- **37.** When the modulating frequency is doubled, the modulation index is halved and the modulating voltage remains constant, the modulation system is
 - (A) Amplitude modulation
 - (B) Phase modulation
 - (C) Frequency modulation
 - (D) All of the above
- **38.** An antenna is a device
 - (A) That converts electromagnetic energy into radio frequency signal
 - (B) That converts radio frequency signal into electromagnetic energy
 - (C) That converts guided electromagnetic waves into free space electromagnetic waves and vice-versa
 - (D) None of these
- **39.** While tuning in a certain broadcast station with a receiver, we are actually
 - (A) Varying the local oscillator frequency
 - (B) Varying the frequency of the radio signal to be picked up
 - (C) Tuning the antenna
 - (D) None of these
- **40.** Indicate which one of the following system is digital
 - (A) Pulse position modulation
 - (B) Pulse code modulation
 - (C) Pulse width modulation
 - (D) Pulse amplitude modulation
- **41.** In a communication system, noise is most likely to affect the signal
 - (A) At the transmitter
 - (B) In the channel or in the transmission line
 - (C) In the information source
 - (D) At the receiver
- 42. The waves used in telecommunication are
 - (A) IR (B) UV
 - (C) Microwave (D) Cosmic rays

- 43. In an FM system a 7 kHz signal modulates 108 MHz carrier so that frequency deviation is 50 kHz. The carrier swing is
 (A) 7.143 (B) 8
 - (C) 0.71 (D) 350
- **44.** Consider telecommunication through optical fibres. Which of the following statements is not true
 - (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
- **45.** The phenomenon by which light travels in an optical fibres is
 - (A) Reflection
 - (B) Refraction
 - (C) Total internal reflection
 - (D) Transmission
- **46.** 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/cm*³)
 - (A) 60° (B) 45°
 - (C) 30° (D) 15°
- 47. In a diode AM-detector, the output circuit consist of $R = 1k\Omega$ and $C = 10 \ pF$. A carrier signal of 100 *kHz* is to be detected. Is it good
 - (A) Yes
 - (B) No
 - (C) Information is not sufficient
 - (D) None of these

Communication system

48. Consider an optical communication system operating at λ ~800 *nm*. Suppose, only 1% of the optical source frequency is the available channel bandwidth for optical communication. How many channels can be accommodated for transmitting audio signals requiring a bandwidth of 8 *kHz*

(A) 4.8×10^8 (B) 48

(C) 6.2×10^8 (D) 4.8×10^5

- **49.** A photodetector is made from a semiconductor In $_{0.53}Ga$ $_{0.47}As$ with $E_g = 0.73 \ eV$. What is the maximum wavelength, which it can detect
 - (A) 1000 nm (B) 1703 nm
 - (C) 500 nm (D) 173 nm
- **50.** A transmitter supplies 9 kW to the aerial when unmodulated. The power radiated when modulated to 40% is
 - (A) 5 kW
 (B) 9.72 kW
 (C) 10 kW
 (D) 12 kW
- **51.** 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%
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(C) 65%	(D)71%
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52. The total power content of an AM wave is 1500 *W*. For 100% modulation, the power transmitted by the carrier is

(A)	500	W	(B) 700 W
(C)	750	W	(D) 1000 W

53. The total power content of an AM wave is 900 *W*. For 100% modulation, the power transmitted by each side band is

,	 			
(A) 50 W		(B)	100	W
(C) 150 W		(D)	200	W

54. The modulation index of an FM carrier having a carrier swing of 200kHz and a modulating signal 10kHz is

(A) 5 (E	B) 10
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(C) 20	(D)25
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55. A 500 Hz modulating voltage fed into an FM generator produces a frequency deviation of 2.25 kHz. If amplitude of the voltage is kept constant but frequency is raised to 6 kHz then the new deviation will be

(A) 4.5 <i>kHz</i>	(B) 54 <i>kHz</i>
(C) 27 kHz	(D) 15 <i>kHz</i>

- 56. 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
- **57.** The maximum peak to peak voltage of an AM wire is 24mV and the minimum peak to peak voltage is 8mV. The modulation factor is
 - (A) 10%
 (B) 20%
 (C) 25%
 (D) 50%
- **58.** 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

(A) 1490, 1510 (B) 1510, 1490
(C)
$$\frac{1}{1490}, \frac{1}{1510}$$
 (D) $\frac{1}{1510}, \frac{1}{1490}$

59. What is the modulation index of an over modulated wave

(A)	1	(B) Zero
· /		

(C) < 1	(D)>1
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- 60. Basically, the product modulator is
 (A) An amplifier (B) A mixer
 (C) A frequency separator (D) A phase separator
- 61. 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
 - (A) 50% (B) 40%

(C) 25%	(D)15%
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62. The bit rate for a signal, which has a sampling rate of 8 kHz and where 16 quantisation levels have been used is (A) 32000 *bits/sec* (B) 16000 *bits/sec*

(C) 64000 *bits/sec* (D) 72000 *bits/sec*

63. 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%

- **64.** In AM, the centpercent modulation is achieved when
 - (A) Carrier amplitude = signal amplitude
 - (B) Carrier amplitude \neq signal amplitude
 - (C) Carrier frequency = signal frequency
 - (D) Carrier frequency \neq signal frequency

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

(A) $\sim 1.2 \times 10^{12} m^{-3}$ (B) $\sim 10^6 m^{-3}$ (C) $\sim 10^{14} m^{-3}$ (D) $\sim 10^{22} m^{-3}$

66. What should be the maximum acceptance angle at the aircore interface of an optical fibre if n_1 and n_2 are the refractive indices of the core and the cladding, respectively

(A)
$$\sin^{-1}(n_2 / n_1)$$
 (B) $\sin^{-1}\sqrt{n_1^2 - n_2^2}$
(C) $\left[\tan^{-1}\frac{n_2}{n_1}\right]$ (D) $\left[\tan^{-1}\frac{n_1}{n_2}\right]$