Lecture -1

Part -1 Choose the correct answers:

1) An optical fiber provides low-loss transmission over an enormous frequency range of at least 25 THz—even higher with special fibers—which is
    i) Orders of magnitude more than the bandwidth available in any other transmission medium.
    ii) Three time more than the bandwidth available in any other transmission medium.
    iii) 1000s time more than the bandwidth available in any other transmission medium.
2) The main loss mechanism in an optical fiber are:
    i) Material absorption.
    ii) Rayleigh scattering.
    iii) High temperature.
    iv) Electromagnetic interference.
    v) All of them.
3) The material absorption of pure silica in the entire $0.8 - 1.6\ \mu m$ is:
    i) Negligible.
    ii) Not negligible.
    iii) None of these.
4) Bending in optical fiber leads to leakage of power out of the fiber core into cladding and resulting in:
    i) Additional loss.
    ii) Additional power.
    iii) Additional light.
5) In optical fiber, the tighter bend makes smaller bend radius and result:
    i) The larger loss.
    ii) The smaller loss.
    iii) Noting.
6) The bend radius must be of order of:
    i) Few centimeters in order to keep the bending loss less.
    ii) Few meters in order to keep the bending loss less.
    iii) Few kilometers in order to keep the bending loss less.
7) The bending loss at 1550 nm is
    i) Higher than at 1310nm.
    ii) Lower than at 1310nm.
    iii) The same at 1310nm.
8) In optical fiber, the loss increase
    i) Rapidly as the bend radius reduced.
    ii) Linearly as the bend radius reduced.
    iii) Inversely as the bend radius reduced.
9) The optical fiber consist of
    i) Cylindrical core surrounded by a cladding.
    ii) Cylindrical core surrounded by a jacket.
    iii) Cylindrical cladding surrounded by core.
10) The refractive index of material is

i) The ratio off the speed of the light in a vacuum to the speed of the light in the material.
ii) The speed of the light in a vacuum to the speed.
iii) The speed of the light in the material.

11) The refractive index in the core is
i) Slightly higher than in the cladding.
ii) Slightly lower than in the cladding.
iii) higher than in the cladding.

12) Typical multimode fiber has a core
i) Much larger than a wavelength of light.
ii) smaller than a wavelength of light.
iii) The same scale as a wavelength.

13) Single mode fiber has a core
i) The same scale as a wavelength.
ii) Much larger than a wavelength of light.
iii) smaller than a wavelength of light.

14) The total internal reflection is
i) All the energy from the incident ray is reflected.
ii) Some of the energy from the incident ray is refracted.
iii) Nothing of these.

15) The smallest angle of incidence for which we get total internal reflection is called
i) The critical angle.
ii) The incident angle.
iii) The reflected angle.

16) The capacity of an optical communication system is frequently measured in terms of
i) the bit rate–distance product.
ii) the bit rate per second.
iii) the bit rate per average travel time.

17) Narrow pulses with high peak powers and special shapes are called:
i) Solitons.
ii) Lasers.
iii) Normal light.

18) The most commonly used soliton pulses are called:
i) Fundamental solitons.
ii) Normal solitons.
iii) Embedded solitons.

19) The holey fiber has two different classes which work on a different physical principles are:
i) Index guiding.
ii) Photonic bandgap.
iii) None of these.

20) One advantage plastic optical fiber has over glass fiber for home networking is:
i) Simplicity of termination.
ii) able to creep.
iii) Not too heavy.

Part -2 Draw these diagrams:

1) The three bands, S-band, C-band, and L-band, based on amplifier availability, within the low-loss region around 1.55 μm in silica fiber.
2) Cross section and longitudinal section of an optical fiber showing the core and cladding regions. a denotes the radius of the fiber core.
3) Reflection and refraction of light rays at the interface between two media.
4) Propagation of light rays in optical fiber by total internal reflection.
5) Limit on the bit rate–distance product due to intermodal dispersion in a step-index and a graded-index fiber. In both cases, $\Delta = 0.01$ and $n1 = 1.5$.
6) A fundamental soliton pulse and its envelope.

Part -3 Solve these problems from the given text book:

1) Problem 2.1
2) Problem 2.2
3) Problem 2.4
4) Problem 2.5
5) Problem 2.6