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MANIPAL INSTITUTE OF TECHNOLOGY
Manipal University

**SIXTH SEMESTER B.TECH (E & C) DEGREE END SEMESTER EXAMINATION – APRIL / MAY 2017**
**SUBJECT: OPTICAL FIBER COMMUNICATION (ECE - 324)**

**TIME: 3 HOURS** **MAX. MARKS: 50**

**Instructions to candidates**
- Answer **ANY FIVE** full questions.
- Missing data may be suitably assumed.

1A. A single mode fibre has a beat length in the range 7 cm to 1 m. What range of propagation constant differences does this correspond to for an operating wavelength of 1500nm?

1B. Determine the number of TE modes supported by a planar symmetric dielectric waveguide with $n_g$ =1.50, n = 1.3 and d = 4 μm. The operating wavelength is 1300 nm.

1C. Explain with block diagram Mach Zehnder Interferometer.

(5+3+2)

2A. Optical power of 200 mW coupled into an optical fibre reduces to 3.8 mW after propagating through a distance of 10km. Determine the attenuation coefficient α of this fibre in dB/km. Determine the power to be coupled into this fibre if 100 μW of power is to be available at a distance of 85 km.

2B. A power of 4 dBm is available at the output of a fibre of length 30 km. If the attenuation coefficient α is 0.4dB/km at 1310 nm, if optical power output power is 200 μW, determine the amount of power at 30 km?.

2C. Explain mathematically (a) Critical angle and (b) Splice loss

(5+3+2)

3A. Discuss the weakly guiding approximation as applied to a planar dielectric symmetric waveguide.

3B. In a coherent optical communication set-up, it is desired to have an intermediate frequency of 170 GHz. If the wavelength of the laser used as the carrier oscillator is 1300 nm, determine the required local laser wavelength.

3C. Explain material dispersion.

(5+3+2)

4A. For semiconductor optical amplifier, explain the rate equation. Also derive the expression for the gain with the required plots.

4B. Discuss DPSK transmitter and receiver with neat block diagram.

4C. Explain the following.
i) Planner dielectric
ii) Polarization

(5+3+2)

5A. Explain the graphical method of solving the eigenvalue equation for TE modes in planar symmetric waveguide. Explain the features of the solution obtained.

5B. Calculate the maximum entrance angle and numerical aperture of a step index fiber having $n_1$=1.48 and $n_2$=1.46. Assume that the fiber is immersed in a solution whose refractive index is 1.4.

5C. Write disadvantages of DPSK.

(5+3+2)

6A. Explain the working principle of coherent binary FSK receiver with block diagram and mathematical expressions.

6B. A single mode fiber has an index step of 0.003. If the cut-off wavelength is 1300nm, calculate the core radius. Take the core refractive index as 1.4.

6C. What is detector responsivity?

(5+3+2)