Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
Manipal University

SIXTH SEMESTER B.Tech. (E & C) DEGREE END SEMESTER EXAMINATION
MAY/JUNE 2016
SUBJECT: OPTICAL FIBRE COMMUNICATION (ECE - 324)

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

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

1A. For semiconductor optical amplifier, explain the rate equation. Also derive the expression for the gain with the required plots.

1B. A single mode fiber has an index step of 0.004. If the cut-off wavelength is 1300nm, calculate the core radius. Take the core refractive index as 1.45.

1C. What are Pockels and Kerr effects?

(5+3+2)

2A. Explain the graphical method of solving the eigenvalue equation for TE modes in planar symmetric waveguide. Explain the features of the solution obtained.

2B. A step index optical fiber has core and cladding refractive indices as 1.5 and 1.4 respectively. If the core diameter is 40 μm and the operating wavelength is 1500 nm, determine the number of modes supported by this fiber if it is bent circularly with a radius of curvature of 1.2 cm

2C. Write two advantages of DPSK

(5+3+2)

3A. What is birefringence? Discuss its effect on the light propagating in optical fiber waveguide.

3B. Explain DPSK transmitter and receiver with block diagram.

3C. What is detector responsivity?

(5+3+2)

4A. A multimode fiber that has a core of refractive index (RI), n_1 = 1.48, and a cladding of RI n_2=1.46. Find (a) Critical angle (b) Numerical aperture (c) Acceptance angle. Derive an expression for critical and acceptance angle.

4B. 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.

4C. Explain Mach Zehnder Interferometer with the help of a block diagram.

(5+3+2)

5A. Discuss the weakly guiding approximation as applied to a planar dielectric symmetric waveguide.

5B. A power of 5 dBm is available at the output of a fibre of length 10 km. If the attenuation coefficient

alpha is 0.3 dB/km, determine the amount of power which was coupled into the fibre input.

5C. Explain mathematically (a) Splice loss and (b) Bend loss

(5+3+2)

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

6B. Determine the number of TE modes supported by a planar symmetric dielectric waveguide with n_g =1.51, n = 1.4 and d = 4 μm. The operating wavelength is 1300 nm.

6C. Write a note on the following.
i) LP modes
ii) Electro optic effect

(5+3+2)