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. Derive an expression for power carried by the symmetric TE mode propagating in a planar dielectric symmetric waveguide.

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 is 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. Optical power of 5 mW coupled into an optical fibre reduces to 3.5 mW after propagating through a distance of 5 km. Determine the attenuation coefficient α of this fibre in dB/km. Determine the power to be coupled into this fibre if 200 μW of power is to be available at a distance of 80 km.

2C. Write two advantages of DPSK

(5+3+2)

3A. Explain the rate equation for an EDFA. Derive an expression for minimum pump intensity Ip(r, z) that is required, so as to amplify the message signal.

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. What are advantages of EDFA?

(5+3+2)

5A. What is the cause for waveguide dispersion in optical fibers? Derive the expression for pulse spreading when the light pulse has travelled over a length 'L' due to waveguide dispersion. If the spectral width of the light source is 50nm, emitting at wavelength of 850nm and D = -5ps/nm-Km, calculate the pulse broadening if the pulse has travelled a distance of 100 Km.

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. Write notes on (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. Calculate the number of modes at 1550 nm and 1300nm in a graded index optical fiber having a parabolic index profile , a 20μm core radius, n_1= 1.48 and n_2=1.46.

6C. What is frequency chirping?

(5+3+2)