Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
Manipal University

SIXTH SEMESTER B.TECH. (E & C) DEGREE END SEMESTER EXAMINATION - APRIL / MAY 2017
SUBJECT: OPTICAL FIBER COMMUNICATION (ECE - 4011)

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

Instructions to candidates
- Answer **ALL** questions.
- Missing data may be suitably assumed.

1A.	Derive Eigen value equation for symmetric TM modes supported by symmetric planar waveguide.
1B.	Explain the concept of Birefringence in a planar dielectric waveguide with necessary plots and equations.
1C.	Consider a planar dielectric waveguide which has a material of R.I =1.56 as its substrate, a guiding layer R.I of 1.6 and free space as its cover. Find minimum angle with respect to the normal with which a ray of light can be incident at the guide –cover or guide - substrate interface and still remain confined to the guiding layer. Also mention different cases planar dielectric waveguide referred as planar symmetric waveguide / planar asymmetric waveguide.
	(4+4+2)
2A.	Staring from fundamentals, derive equations for longitudinal components of electric and magnetic fields of a cylindrical optical waveguide.
2B.	With neat diagrams, derive the expression for pulse broadening due to material dispersion in an optical fibre.
2C.	Optical fiber has following parameters. Core R.I = 1.55, Cladding R.I = 1.51, Core diameter = 50μm. If light of operating wavelength of 800nm is launched into this fiber from a medium of R.I = 1.32, find i) Numerical Aperture ii) Maximum acceptance angle. iii) V number iv) Number of modes supported.
	(4+4+2)
3A.	Discuss degradation in optical fibers due to scattering and radiation losses.
3B.	With necessary mathematical equations, explain dispersion compensation method using Dispersion compensating fiber. Optical fiber length = 20KM, λ = 1550nm D_{mat} (λ) = 15 ps /nm –km, D_{wg} (λ) = 2 ps /nm –km, length of DCF = 2KM. How do you compensate dispersion?
3C.	Explain application of optical fibres in PC to PC communication.
	(4+4+2)
4A.	For Semiconductor Optical Amplifier, find expression for gain.
4B.	With necessary diagrams, explain Pulse code modulation in optical communication system.
4C.	Consider an EDFA in C band used as a power amplifier with Input = 0 dBm, Output = 10dBm, pump wavelength = 980nm. Calculate pump input power.

	(4+4+2)
5A.	Describe frequency hoping and spectral and phase intensity encoding of OCDMA used in optical fiber communication
5B.	Explain linear electro- optic effect with regard to wave propagation in an optical communication media.
5C.	With block diagram, explain destructive and non-destructive methods of fibre attenuation measurement.
	(4+4+2)