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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- Feb 2018

B.Tech 8th Semester

COURSE CODE: 11B1WEC834 MAX. MARKS: 15

COURSE NAME: Optical Communication Systems

COURSE CREDITS: 03 MAX. TIME: 1Hr

Note: *All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.*

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1. [3 marks] Compare briefly satellite and optical communication and list the advantages of optical communication. CO-1

2. [8 marks] Answer the following using Ray model propagation in optical fiber, assuming core and cladding refractive index, n_1 and n_2, respectively. CO-1
   a. Explain in short total internal reflection and write condition on n_1 and n_2 to achieve this in an optical fiber.
   b. Define Numerical Aperture (NA) of an optical fiber and derive the formula to evaluate NA.
   c. Explain Dispersion (pulse broadening) phenomenon of an optical fiber. Derive approximate formula for pulse broadening.
   d. Discuss the choice of n_1 and n_2 with respect to NA formula derived in part b) and dispersion formula derived in part c). State the values of n_1 and n_2 for practical fibers.

3. [4 marks] Answer the following using wave model in optical fiber CO-1
   a. Write Maxwell's equations for a source-free medium inside optical fiber.
   b. The field equations obtained in part a) are solved to obtain wave equations and the solution of wave equation in using separation of variables is given by $\Psi=R(r)\Phi(\varphi)Z(z)T(t)$ in cylindrical coordinate system, where Ψ represents electric or magnetic field intensities. Write the solutions of functions $\Phi(\varphi)$, $Z(z)$, and $T(t)$ to be chosen to simplify the results, and argument why to choose these solutions of the functions.

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