Prof G. Singh

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- December 2017

B. Tech (7th Semester)

Electronics and Communication Engineering

COURSE CODE: **10M11EC112** MAX. MARKS: **35**

COURSE NAME: **Advanced Satellite and Fiber Optic Communications**

COURSE CREDITS: **03** MAX. TIME: **Two Hour**

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

Q. 1(a) Derive the expression for material dispersion parameter. Discuss the role of zero material dispersion in optical fiber. **[3]**

(b) A single mode step index fiber has a core index of 1.46 and a core diameter of 8μm. The relative refractive index difference is 0.52%. Calculate the cutoff wavelength of the fiber. **[4]**

Q. 2(a) What is the group velocity dispersion in single mode optical fiber? Find out the group velocity dispersion parameter. **[3]**

(b) In the single mode optical fiber, even in the absence of material dispersion, the group velocity of the mode varies with the normalized frequency parameters (V). What is the name of this type of dispersion? Derive the mathematical expression for such type of dispersion parameters. **[4]**

Q. 3(a) What are the causes of attenuation in optical fibers? Why could bending loss in single mode fiber be severe? What can be done to minimize this loss? **[3]**

(b) Low earth orbit satellites use mainly L-band, with ranges varying from 1000 km to 2500 km.

Calculate the maximum and minimum path-loss from earth to a satellite, in dB, for the uplink frequency of 1.6 GHz, and the downlink frequency of 1.5 GHz. **[4]**

Q. 4(a) What are the characteristics parameters of the single mode optical fiber? Discuss the effects of fiber birefringence over single mode fiber optic communication. **[3]**

(b) A satellite in GEO orbit is a distance of 39,000 km from an earth station. The required flux density at the satellite to saturate one transponder at a frequency of 14.3 GHz is -90 dBW/m^2. The earth station has a transmitting antenna with a gain of 52 dB at 14.3 GHz. Find, **a)** the EIRP of the earth station and **b)** the output power of the earth station transmitter. **[4]**

Q. 5(a) What is the equivalent isotropic radiated power (EIRP)? Establish a relation between the received power and EIRP in the satellite communication system considering only the free-space path loss. **[3]**

(b) What is the role of transponder is satellite communication system? Describe its working with suitable diagram. **[4]**