CONTINUOUS ASSESSMENT (2025)
EE5134 OPTICAL COMMUNICATIONS AND NETWORKS Part II

**Q. 1**

(a) An optical fiber communication link has an attenuation of 0.45 dB/km, laser input optical power of 1.2 mW, and receiver sensitivity of 60 μW. Calculate the maximum transmission distance of this fiber link.

(5 marks)

(b) An optical fiber has core and cladding refractive index of 1.46 and 1.44, respectively.

(i) Calculate the critical angle at core-cladding interface.

(5 marks)

(ii) Calculate its acceptance angle and NA.

(5 marks)

(c) Explain the difference between Rayleigh Scattering and Raman Scattering in optical fiber. (hint: can use figures/drawings to explain)

(5 marks)

**Q. 2**

(a) Modulator based on electro-absorption effect is one type of external optical modulator for lightwave system

(i) Explain the mechanism and advantages of Electro-absorption Modulator (EAM).

(5 marks)

(ii) What are the limiting factors on the performance of modulator-integrated DFB laser?

(5 marks)

(b) A photodiode has a responsivity of 0.86 A/W and a saturated input power of 1.8 mW.

(i) If the incident light power is 1.2 mW, calculate its photocurrent and provide the answer in mA.

(5 marks)

(ii) If the incident light power is 2.4 mW, can we calculate its photocurrent? (if yes, please provide the photocurrent in mA; if no, please provide the reason behind)

(5 marks)

**Appendix**

Speed of light in vacuum = $3\times10^{8}$ m/s,
Electric charge = $1.6\times10^{-19}$ C,
1eV = $1.6\times10^{-19}$ J
Planck's constant = $6.63\times10^{-34}$ J·s,
Boltzmann constant = $1.38\times10^{-23}$ J/K
Room temperature = 300K
Air refractive index = 1