JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
TEST 3 EXAMINATIONS – MAY 2018
B.Tech VIIIth Semester

COURSE CODE: 11B1WEC834   MAX. MARKS: 35
COURSE NAME: OPTICAL COMMUNICATION SYSTEMS
COURSE CREDITS: 03   MAX. TIME: 2 HRS

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

Q1 Short answer questions [**10 x 1.5 = 15 Marks**]

   i.   Differentiate between skew ray and meridional ray.
   ii.   Define Birefringence and fiber beat length.
   iii. Write any four advantages of Optical Fiber Communication.
   iv. Differentiate between phase velocity and group velocity.
   v.   Define acceptance angle and numerical aperture of and optical fiber.
   vi. What is cut off wavelength?
   vii. Differentiate between micro bending and macro bending losses.
   viii. List the different types of dispersion that occur in optical fibers.
   ix. What are modes? Differentiate between symmetrical and asymmetrical modes of a planar SI waveguide.
   x.   What is dark current?

Q2(a) What is semiconductor optical amplifier? What requirements should a double hetero structure meet to be used as an SOA? [**3 Marks**]

(b) Consider a typical InGaAsP SOA operating at 1.3μm with the following parameters: active region width = 5μm, active region thickness = 0.5μm, active region length = 200μm, confinement factor $\Gamma = 0.4$, time constant $\tau_c = 1$ns, $\sigma_g = 3 \times 10^{-20}$ m^2, $N_{tr} = 1.0 \times 10^{24}$/m3 and bias current I = 100mA. Calculate (i) Psat (ii) the zero-signal gain coefficient (iii) the zero-signal net gain.

[**3 Marks**]

Q3(a) Explain the concept of WDM and DWDM. [**3 Marks**]

(b) A 2 x 2 loss-less fiber coupler is using identical single mode fibers. Calculate the interaction length required to achieve a splitting ratio of 10:90. [**2 Marks**]

Q4(a) A pin photodiode has quantum efficiency of 50% at $\lambda = 0.90$μm. Calculate (i) its responsivity at this wavelength (ii) the received optical power if the mean photocurrent is 10^{-6}A (iii) the corresponding number of received photons at this wavelength. [**3 Marks**]

(b) Starting from Maxwell's equations, derive an expression for TM modes in SI fiber. [**3 Marks**]

(c) With the help of suitable diagram explain the working of a longitudinal electro-optic modulator.

[**3 Marks**]

****