Register Number: ……..

B.E DEGREE EXAMINATIONS: NOV/DEC 2012

Seventh Semester

ELECTRONICS AND COMMUNICATION ENGINEERING

ECE120**:** Optical Communication

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Calculate the numerical aperture of an optical fiber with n1=1.49 and n2=1.47.
   a) 0.034 b) 0.24228
   c) 0.0172 d) 0.0456
2. Calculate the modal birefringence of optical fiber of beat length 7 cm at 1550nm
   a) 1.444×10^{-5} b) 51, 6x103
   c) 3.412×10^{-5} d) 2.214×10^{-5}
3. Which type of fiber supports more bandwidth?
   a) Multimode fiber b) graded index fiber
   c) single mode fiber d) step index fiber
4. Zero material dispersion point occurs at
   a) 1400nm b) 1370nm
   c) 1550nm d) 1270nm
5. In LED, the total number of recombinations per second
   a) $R_r + R_{nr} = I/q$ b) $R_r + R_{nr} = q/I$
   c) $R_r + R_{nr} = q/I$ d) $R_r - R_{nr} = I/q$
6. In the plane perpendicular to the active area junction, edge emitting laser diodes have an emission pattern with FWHM of _ _ _ _.
   a) $10 – 20^o$ b) $40 – 60^o$
   c) $30 – 50^o$ d) $5 – 10^o$
7. The photodiode capacitance is 3 pf, the amplifier capacitance is 4pf and load resistor is 1kohm,then bandwidth is
   a) 23 MHz b) 9.65x10-5 Hz
   c) 33 MHz d) 10.65x10-5 Hz
8. With 65% of quantum efficiency at a wavelength of 900nm, what is the responsivity of an APD.
   a) 4.7×10^{-3} A/w b) 5.2×10^{-3} A/w

c) 1.5×10^{-3} A/w d) 3.72×10^{-3} A/w

9. Find the number of wavelengths supported by WDM technique from 1525 to 1565 nm band with a spectral band of 0.8nm.
   a) 70 b) 50
   c) 15 d) 30
10. The shape of a soliton pulse is
   a) Square shape b) Bell shape
   c) Rectangular shape d) Triangular shape

PART B (10 x 2 = 20 Marks)

11. Define critical angle and acceptance angle.
12. What is mode volume?
13. Define attenuation and its units.
14. What is mode field diameter?
15. What is a double hetero structure?
16. Mention any four common end face defects.
17. List out the noise that gets added in an optical receiver.
18. What are photocarriers?
19. What are all optical amplifiers?
20. Draw the basic frame structure of a STS-1 SONET frame.

PART C (5 x 14 = 70 Marks)

21. a) (i) Discuss in detail the need and the elements of an optical fiber communication system. (8)

    (ii) A step index multimode fiber with a numerical aperture of 0.24 support approximately 1200 modes at an 1300nm wavelength. (6)

    i.What is the diameter of its core?

    ii.How many modes does the fiber supports at 1550nm?

(OR)

b) Discuss in detail about the mode theory of circular waveguides.

22. a) (i) What is material dispersion? Why it leads to pulse broadening? (7)

    (ii) How the waveguide structure of fiber leads to pulse dispersion? (7)

(OR)

b) Explain the design optimization of single mode fibers - refractive index profile.

23. a) (i) Starting from basic principle discuss how lasing action takes place overcoming the losses of the medium. Also get expression for threshold gain. (10)

(ii) Write short notes on LED types. (4)

(OR)

b) (i) Discuss the various lencing schemes used in optical fiber communication. (10)

(ii) Write short notes on splices (4)

24. a) Draw and explain PIN Photodiode and obtain its responsivity. Also compare it with APD photodiode.

(OR)

b) Discuss the different noise sources and disturbances that affect the optical pulse detection mechanism.

25. a) Explain the operation of EDFA with energy band diagrams; also calculate its Power and quantum conversion efficiencies.

(OR)

b) Illustrate with examples how power budgeting is done for an optical link; also discuss how rise time is estimated for an optical link.

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