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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Seventh Semester, B.E. - Electronics and Communication Engineering

Semester End Examination; Dec. - 2014

Optical Fiber Communications

Time: 3 hrs

Max. Marks: 100

Note: Answer any *FIVE* full questions, selecting at least *TWO* full questions from each part.

PART - A

1. a. Derive an expression for Numerical aperture of step-index fibers. 8
- b. With necessary diagrams, explain the following:
 - (i) Outside Vapor-phase oxidation 12
 - (ii) Vapor-phase Axial deposition
2. a. Derive the expression for (i) wave guide dispersion (ii) Material Dispersion. 12
- b. Draw the structure of Edge emitting LED and explain the operation. 8
3. a. Explain various types of fiber splicing techniques and fiber connectors. 10
- b. Discuss the different lensing schemes for coupling improvement. For a non imaging microsphere, Prove that power coupled into a full aperture angle 2θ is $P_L = P_S \left(\frac{R_L}{\gamma_s} \right)^2 \sin^2 \theta$. 10
4. a. Draw the schematics of PIN photodiode and APD, explain. 12
- b. A Germanium p-i-n photodiode with active dimensions of $75 \times 50 \mu\text{m}$ has a quantum efficiency of 55% when operating at a wave length of $13\mu\text{m}$ at this wave length the measured dark current is 8 nA. Calculate: i) The noise equivalent power ii) specific detectivity. 8

PART - B

5. a. Explain multi channel Amplitude modulation. 8
- b. Write a note on sub carrier multiplexing. 8
- c. Derive an expression for the total rise time of the optical digital link. 4
6. a. Explain the working principle of WDM network with a neat diagram. 8
- b. Write short notes on the following:
 - (i) 2 x 2 wave guide coupler (ii) Fiber grating filters. 12
7. a. Explain the three possible configurations of Erbium –doped fiber amplifier. 10
- b. Derive an expression for the power conversion efficiency and gain for Erbium-doped fiber amplifier (EDFA). 10
8. a. Explain the architecture and layers function of SONET with neat diagram. 12
- b. Write a note on optical add/drop multiplexing. 8