KADI SARVA VISHWAVIDYALAYA
B.E. SEMESTER 6thEXAMINATION MAY – 2015

SUBJECT CODE: EC – 604   **SUBJECT NAME**: OPTICAL FIBER COMMUNICATION
DATE: 04/05/2015   **TIME**: 10:30AM To 1:30PM   **TOTAL MARKS**: 70

Instructions:
1. Answer each section in separate answer sheet.
2. Use of scientific calculator is permitted.
3. All questions are compulsory.
4. Indicate **clearly**, the options you attempted along with its respective question number.
5. Use the last page of main supplementary for rough work.

Section – 1

Que. 1   **(All Compulsory)**

    (A)   Briefly Describe the block diagram of Optical Communication Systems.   **(5)**

    (B)   Define Internal Quantum Efficiency for LED & derive the expression for that.   **(5)**

    (C)   Give the comparison of Step Index and Graded Index fibers.   **(5)**

OR

    (C)   Define signal attenuation and how is it mathematically expressed. Explain the following: **(5)**
        (1) Scattering Losses.
        (2) Bending Losses.

Que. 2   **Answer the following questions.**

    (A)   Derive the Lasing Threshold condition for Laser diode.   **(5)**

    (B)   A step index fiber in air has a numerical aperture of 0.16, a core refractive index of 1.45 and a core diameter of 60 μm. Calculate refractive index of cladding, relative refractive index difference (Δ) and acceptance angle. Determine the normalized frequency for the fiber when light at a wavelength of 0.9 μm is transmitted. Further, estimate the number of guided modes propagating in the fiber.   **(5)**

OR

    (A)   Write a short note on Optical Fiber Connectors.   **(5)**

    (B)   Discuss Optical Time Domian Reflectomarary in detail.   **(5)**

Que. 3   **Answer the following questions.**

    (A)   Discuss briefly the structure of Edge emitting LED with neat sketch.   **(5)**

    (B)   Mention the advantages of optical communication over conventional communication.   **(5)**

OR

    (A)   Discuss optical power loss model for a point to point link.   **(5)**

    (B)   A Silicon APD has a quantum efficiency of 75 % at a wavelength of 900 nm. If 0.5 mw of optical power produces a multiplied photo current of 10 mA, then what is avalanche gain for this device.   **(5)**

Section – 2

Que. 4 **(All Compulsory)**

(A) Define the following terms related to Photo Detector. (5)
   (1) Responsivity   (2) Quantum efficiency
   (3) Cut off wavelength   (4) Signal to Noise Ratio
   (5) Dark Current

(B) Explain any one method for Optical Dispersion measurement. (5)

(C) Give the comparison of Single Mode and Multi Mode fibers. (5)

OR

(C) Write short notes on Synchronous Optical Fiber Networks (SONET). (5)

Que. 5 **Answer the following questions.**

(A) What is Eye Diagram. Explain it and give its significance. (5)

(B) A photo diode has a quantum efficiency of 75% when photons of (5)
   energy 1.5×10^{-19} J are incident upon it.
   (1) At what wavelength is the diode operating?
   (2) Calculate the incident optical power required to obtain a photo
   current of 3.5 μA.

OR

(A) Explain the phenomenon and the conditions for the total internal (5)
   reflection of an optical ray incident at an angle θ at the interface
   between two media and derive Numerical Aperture.

(B) Justify the following statements: (5)
   (1) Signal distortion mechanism in optical fiber limits the information
   rate of the signal.
   (2) A mode remains guided as long as propagation factor β satisfies
   the condition $n_2k < \beta < n_1k$

Que. 6 **Answer the following questions.**

(A) Explain the principle, characteristics and operation of Avalanche (5)
   Photodiode.

(B) With the help of necessary figure properly explain DWDM in detail. (5)

OR

(A) Explain Semiconductor Optical Amplifiers (SOAS). (5)

(B) A multimode step index fiber with a core diameter of 80μm and a (5)
   relative index difference of 1.5% is operating at a wavelength of 0.85
   μm. If the core refractive index is 1.48 calculate the normalized
   frequency for the fiber and the number of guided modes.

-----ALL THE BEST----

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