BACHELOR OF TECHNOLOGY (C.B.C.S.) (2014 COURSE)
B.Tech.Sem - VIII E & TC : WINTER- 2022
SUBJECT : OPTICAL FIBER COMMUNICATION

Day : Thursday

Time : 02:30 PM-05:30 PM

Date : 24-11-2022

W-13375-2022

Max. Marks : 60

N.B.
1) All questions are **COMPULSORY**
2) Figures to the right indicate **FULL** marks.
3) Draw neat and labeled diagram **WHEREVER** necessary.
4) Assume suitable data if necessary.

Q.1 a) What are the functions of the core and cladding in an optical fiber? Why should their refractive indices be different? Would it be possible for the light to be guided without cladding? **(05)**

b) What is the significance of Maxwell's equations? Write these equations for the metallic and dielectric media. **(05)**

OR

a) A graded index single mode fiber has a core axis refractive index of 1.5, a triangular index profile ($\alpha = 1$) in the core and a relative index difference of 1.3 %. Calculate the core diameter of the fiber if it has to transmit at wavelength of 1.3 µm. **(05)**

b) What are modes? What is the difference between phase velocity and group velocity? **(05)**

Q.2 a) The radiative and non – radiative recombination lifetimes of the minority carriers in the active region of a double hetereojunction LED are 80ns and 120 ns respectively. Determine the total carrier recombination lifetime and the power internally generated within the device when the peak emission wavelength is 0.87 µm at a derive current of 40mA. **(05)**

b) What are the different types of photodiodes used in optical communication system? Explain one of these with neat and clean diagram. **(05)**

OR

a) What are the different types of LED? Differentiate between LED and LASER. **(05)**

b) A silicon APD, operating at a wavelength of 0.9µm exhibits a quantum efficiency of 90%, a multiplication factor of 800 and a dark current of 2 nA. Calculate the rate at which photons should be incident on the device so that the output current (after avalanche gain) is greater than the dark current. **(05)**

Q.3 a) Discuss, with the aid of suitable diagrams, the three types of fiber to fiber misalignment which may contribute to insertion loss at a joint. **(05)**

b) What is attenuation? Explain the different types of it. **(05)**

OR

a) Distinguish between a splice and connector, with aid of suitable diagram. **(05)**

b) A mechanical splice in a multimode SI fiber has a lateral offset of 12% of the **(05)** fiber core diameter. The RI of the core is 1.5 and an index matching fluid with RI of 1.47 is inserted in the splice between the two fiber ends. Determine the insertion loss of the splice. Assume that there are no other types of misalignment.

Q.4 a) How is the fiber diameter measured? **(05)**

b) What is meant by OTDR? Discuss with suitable diagram, how this method **(05)** may be used in field measurement?

OR

a) Explain the uncabled fiber cut off wavelength measurement. **(05)**

b) Write short note on preamplifier in optical communication system. **(05)**

Q.5 a) What do you mean by modularity and scalability of optical network? **(05)**

b) Write a short note on wavelength routing networks. **(05)**

OR

a) Differentiate between optical circuit switched network and optical packet **(05)** switched network.

b) How does the non-linearity effect the performance of optical network? **(05)**

Q.6 a) Write a short note on WDM with EDFA. **(05)**

b) Explain the network with ultra-high capacity system. **(05)**

OR

a) Explain the general passive optical network. **(05)**

b) Write short note on soliton. **(05)**

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