Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. SEMESTER I (old course)–EXAMINATION (Remedial) – WINTER 2015

Subject code: 710405 **Date: 14/12/2015**

Subject Name: Fiber Optic Communication

Time: 10:30 AM to 1:00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	What are the function of the core and cladding in an optical fiber? What is total internal reflection? Why is it necessary to meet the condition of total internal reflection at the core-cladding interface?	**07**
	(b)	(i) Explain the basic principle of operation of semiconductor Optical Amplifier.	**04**
		(ii) Explain the application areas of optical amplifier.	**03**
Q.2	**(a)**	List out the fiber fabrication methods? Describe VPD method.	**07**
	(b)	What are modes in optical? How does are distinguish between symmetric and anti symmetric modes of a planner SI waveguide? A symmetric SI planner waveguide is made of glass with $\eta 1=1.5$, $\eta 2=1.49$. The thickness of the guide layer is 9.83μm and the guide is excited by source of waveguide $\lambda=0.85\mu m$. What is the range of propagation constants? What is the maximum number of modes supported by the guide?	**07**
		OR	
	(b)	A graded index fiber with parabolic profile supports the propagation of two guided modes. The fiber has a relative refractive index difference is 2 % a core refractive index of 1.45 and a core diameter of 75 μm. Calculate the wavelength of light propagation in the fiber. Further, estimate the maximum diameter of the fiber core which can give single mode operation at the same wavelength.	**07**
Q.3	**(a)**	(i) What are intermodal and intra modal dispersion?	**04**
		(ii) What are the components of intra model dispersion in a single mode fiber?	**03**
	(b)	What is meant by OTDR? Discuss, with the aid of diagram, how this method may be used in filed measurements? In addition, mention the merits of this technique.	**07**
		OR	
Q.3	**(a)**	(i) What are the causes of attenuation in optical fiber?	**03**
		(ii) Why could bending loss in single mode fibers be severe? What can be done to minimize this loss?	**04**
	(b)	A step index single mode fiber has a core index of 1.45, a relative refractive difference of 0.3 % and a core diameter of 0.82 μm. Calculate the waveguide dispersion parameters for this fiber at $\lambda=1.30$ μm and $\lambda=1.55$ μm.	**07**

Q.4	**(a)**	Discuss bout the homojunctions and hetrojunctions.	**07**
	(b)	A p-i-n photo diode has a quantum efficiency of 50 % at a wavelength of 09 μm. Calculate (i) its responsively at 0.9 μm, (ii) the received optical power if the mean photocurrent is 10^{-6} A,(iii) the corresponding number of received photon at this wavelength.	**07**

OR

Q.4	**(a)**	Explain working of injection laser; discuss conditions for laser action also.	**07**
Q.4	**(b)**	(i) Determine the power radiated by an LED if its quantum efficiency is 3 % and the weak wavelength is 670 nm.	**03**
		(ii) Determine the external power efficiency of the device if the total efficiency of an injection laser with a GaAs active region is 18%. The voltage applied to the device is 2.5 V and the band gap energy of GaAs is 1.43 ev**.**	**04**

Q.5	**(a)**	Explain the principles of operation of 2 x 2 directional coupler and an N x N star coupler, also mention how can we change the coupling ratio of a 2 x 2 coupler?	**07**
	(b)	(i) What are the unique properties of solitions?	**04**
		(ii) Why are nonlinear effect observed in optical fibers?	**03**

OR

Q.5	**(a)**	Write a note on WDM and DWDM?	**07**
	(b)	Discuss in details EDFA.	**07**

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