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This part of the assignment is structured to test the student’s skill of comprehension and the ability for quick adaptation to rudimentary phase of Research cycle. The list of tasks to be accomplished under this part of assignment is as follows:

1. Through literature search, ONE M.Tech thesis from reputed and recognized University/Institution of International standing has to be chosen related to chosen area of specialization
2. The Abstract and Chapters on Introduction, Objectives, Conclusions and Future recommendations of the selected thesis has to be reviewed

**Problem statement**:

Based upon the above referred review, a technical note should be developed highlighting:

1. Introduction to the Identified “Specific Field of Research”
2. Assumptions of the individual thesis
3. Techniques invoked along with its merits and constraints
4. Recommended suggestions and feasibility of their incorporation
5. Appreciation of the individual thesis reviewed with emphasis on introduction, problem definition and suggested future work
6. Based on suggested future work, the title and aim of the thesis which the student can propose for the Research
7. **Introduction to the Identified “Specific Field of Research”**

Thesis topic: Optimization of optical transmission Systems

### We can see as technology arises we found many innovation, inventions, and solutions for particular problem which would be unsolved from many years. In this science and technology era communication plays very important role. It also includes transmission of data and telecommunication so on. In telecommunication we are fascinated about optical fibers because of its physical and operational properties. Usually rate of transmission of optical fibers is about 100mega bits per second to100 Giga bits per second per channel of optical network. It is possible transmission due to data traffic for higher transmission bandwidth increases. The existing systems for example clouds service, video conferencing, and IPT ( Internet protocol Telephony) consumes bandwidth in available network. To increase the capacity of network we need to keep eye on new network investment i.e. capital expenditure, operational expenditure.

Optical system design depends on modulation format which enhances future upgrade. Dealing with solutions need to take care of modulated format performance efficiency so need to have detailed knowledge on them.

To increase the transmission rate of optical fiber we come across many limitations such as hardware limitation , signal quality etc..

To increase the bits rate per transition need to solve PMD( Polarization Mode Dispersion) and non-linarites named as FWM(Four Wave Mixing).

**2. Assumptions of the individual thesis**

* DSP (Digital signal processing), PDM (Polarization Division Multiplexing ), and coherent polarization techniques are used for transmission of high density optical system.
* Above 100Gbps uses Modulation format
* For higher bit rate Polarization Division Multiplexing technique is used
* For simulation Optisim software is used (5.2 version).
* Wavelength Division Multiplexing‘s physical reach and capacity is Optimized.
* Based on topology, channel optical network is designed.

**3. Techniques invoked along with its merits and constraints**

1. Wavelength Division Multiplexing

2. Physical Topology optimization

3. APON and BPON

1. Wavelength Division Multiplexing: It is technique where multiplexing of several optical carrier signal into one optical fiber by using laser light wavelength.

It is of two types Coarse Wavelength Multiplexing and Dense Wavelength Multiplexing.

a. Coarse Wavelength Multiplexing: Here many signals are combined on beam of laser at different wavelengths for optical fiber transmission. Transmission takes in range of 1270nm and 1610nm. Tolerance level is + or – 3nm.

Advantages: It is of low cost.

* Cost for Network operation is reduced here.
* Due to small devices consumption of power is less>
* Flexible and scalable.
* Economic recovery of optical fibers.

Disadvantages: limited supportable wavelength.

b. Dense Wavelength Multiplexing: transmission and combination of many signals of same optical fiber at different wavelengths. Bit rate varies from 100MB/s and 2.5Gb/s.

Advantages: For transmission and receive of data it uses less fiber core.

* It can be divided into multiple channel.
* When fiber recourses are less there are also network expansion is easily possible.

Disadvantages: Not suitable for low channel i.e. not cost effective

Receivers and transmitters are of complicated type.

Implementation is difficult.

1. Physical Topology optimization: It is technique that uses methods of mathematical analysis and it helps to material optimization.

For optimization we use network topology. Here we have tree, branch, bus and ring, mesh.

Mesh and star are used for optical networks with larger scale.

Mesh topology ensures strong redundancy and high capacity of transmission. Ring topology widely used because of its low cost and installation .

APON and BPON: It built on Asynchronous Mode with electric layer. It is rarely used in optical transmission. It transmits at 155.52 Mbps and 622.08 Mbps in asymmetric. In Broad band PON

of download speed in case of the asymmetric system. On the other hand, for Broadband PON 622.04 Mbps in symmetric systems and 1244.16 Mbps in asymmetric.

These are used for data transmission.

1. **Recommended suggestions and feasibility of their incorporation**

Transmission rate optimization in optical systems is possible by implementation of Electronic data capture and advanced modulation formats.

The tap weights were optimization of tap weight done by minimum mean square error criterion.

OptSim software is used for simulations.

Non Return to Zero method is used for PON systems. Due to wider spectrum Return to Zero is not suitable for hybrid PON. High interference is occurs.

**5.Appreciation of the individual thesis reviewed with emphasis on introduction, problem definition and suggested future work .**

While going with thesis we can get new methods for optimization of optical fiber and new mode of transmission of data with high speed and with more accuracy without noise. High bandwidth , transmission for longer distance is possible. Improvement of existing methods in optical communication is done in the thesis.

**6.Based on suggested future work, the title and aim of the thesis which the student can propose for the Research**

For higher transmission it demands high efficient equipment and techniques for optimizing optical fiber. CWDM and DWDM systems are optimized and maximum channel spacing is possible. We can find still more optimized techniques with different topology and transmission network.

Title of thesis: Methods for optimizing optical fiber.

Aim: It deals with optical fiber optimization to improve its performance by using different transmission methods.

# **References**

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Agalliu, R., 2017. Optimization of optical transmission systems