**GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA**

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**ASSIGNMENT OF FINITE ELEMENT METHOD**

**M.Tech-Structural Engineering**

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**Chapter No. 1 – What is Engineering ?**

Engineering is the application of scientific, economic, social, and practical knowledge in order to invent, design, build, maintain, research, and improve structures, machines, devices, systems, materials, and processes.

**1.1 Meaning**

The term Engineering is derived from the Latin ingenium, meaning "cleverness" and ingeniare, meaning "to contrive, devise".

**1.2 History**

Engineering has existed since ancient times as humans devised fundamental inventions such as the wedge, lever, wheel, and pulley. Each of these inventions is essentially consistent with the modern definition of engineering.

**1.3 Example from History**

The Ancient Romans built aqueducts to bring a steady supply of clean fresh water to cities and towns in the empire.

**1.4 Ancient Era**

The pyramids in Egypt, the Hanging Gardens of Babylon, pyramids of the Mayan, Inca and Aztec Empires, the Great Wall of China, the Brihadeeswarar Temple of Thanjavur and tombs of India, among many others, stand as a testament to the ingenuity and skill of the ancient civil and military engineers.

**1.5 Example in Modern Time**

The design of a modern auditorium involves many branches of engineering, including acoustics, architecture and civil engineering.

**1.6 Main branches of Engineering**

Engineering is often characterized as having four main branches:

(a) Chemical Enginering

(b) Civil Engineering

(c) Electrical Engineering

(d) Mechanical Engineering

**Chapter No. 2 – What is Civil Engineering ?**

Civil engineering is a professional engineering discipline that deals with the design, construction, and maintenance of the physical and naturally built environment, including works like roads, bridges, canals, dams, and buildings.

**2.1 Types of Civil Engineering**

(a) Architectural engineering

(b) Environmental engineering

(c) Geotechnical engineering

(d) Structural engineering

(e) Transportation engineering

(f) Water resources engineering

(g) Construction engineering

**2.2 History of Civil Engineering**

The earliest practice of civil engineering may have commenced between 4000 and 2000 BC in Ancient Egypt and Mesopotamia (Ancient Iraq) when humans started to abandon a nomadic existence, creating a need for the construction of shelter. During this time, transportation became increasingly important leading to the development of the wheel and sailing.

El Castillo in Mexico was built by the Maya people of the Post Classic. The northeast column temple also covers a channel that funnels all the rainwater from the complex some 40 metres (130 ft) away to a rejollada, a former cenote.

**2.3 Father of Civil Engineering**

The first self-proclaimed civil engineer was John Smeaton, who constructed the Eddystone Lighthouse.

**2.4 Recent example of Civil Engineering**

Burj Khalifa, known as Burj Dubai before its inauguration, is a skyscraper in Dubai, United Arab Emirates. It is the tallest artificial structure in the world, standing 829.8 m.

**Chapter No. 3 – What is Structural Engineering ?**

Structural engineering is a field of engineering dealing with the analysis and design of structures that support or resist loads.

**3.1 Work of a Structural Engineer**

Structural engineers are responsible for engineering design and analysis. Entry-level structural engineers may design the individual structural elements of a structure, for example the beams, columns, and floors of a building. More experienced engineers may be responsible for the structural design and integrity of an entire system, such as a building.

**3.4 History of Structural Engineering**

Structural engineering dates back to 2700 B.C.E. when the step pyramid for Pharaoh Djoser was built by Imhotep, the first engineer in history known by name. Pyramids were the most common major structures built by ancient civilizations because the structural form of a pyramid is inherently stable and can be almost infinitely scaled (as opposed to most other structural forms, which cannot be linearly increased in size in proportion to increased loads).

**3.5 Example of Structural Engineering**

Burj Khalifa, in Dubai, the world's tallest building, shown under construction in 2007.

**Chapter No. 4 – What is a Building ?**

A building, is a man-made structure with a roof and walls standing more or less permanently in one place, such as a house or factory. Buildings come in a variety of shapes, sizes and functions, and have been adapted throughout history for a wide number of factors, from building materials available, to weather conditions, to land prices, ground conditions, specific uses and aesthetic reasons.

**4.1 History of Building**

A report by Shinichi Fujimura of a shelter built 500 000 years ago is doubtful since Fujimura was later found to have faked many of his findings. Supposed remains of huts found at the Terra Amata site in Nice purportedly dating from 200 000 to 400 000 years ago. have also been called into question. There is clear evidence of home-building from around 18 000 BC. Buildings became common during the Neolithic.

**4.2 Types of Building**

(a) Residential

(b) Commercial