ACHAPTER 1

INTRODUCTION

1.1GENERAL

The analysis, design and construction of offshore structures is arguably one of the most demanding sets of tasks faced by the engineering profession. Over and above the usual conditions and situations met by land-based structures, offshore structures have the added complication of being placed in an ocean environment where hydrodynamic interaction effects and dynamic response become major considerations in their design. In addition, the range of possible design solutions, such as: ship-like Floating Production Systems, (FPSs), and Tension Leg Platform (TLP) deep water designs; the more traditional jacket and jack-up (space truss like) oil rigs; and the large member sized gravity-style offshore platforms themselves, pose their own peculiar demands in terms of hydrodynamic loading effects, foundation support conditions and character of the dynamic response of not only the structure itself but also of the riser systems for oil extraction adopted by them.[8]

Offshore structures, constructed on or above the continental shelves and on the adjacent continental slopes, take many forms and serve a multitude of purposes: towers for microwave transmission, installations for power generation , portable pipeline systems for

mining the ocean floor, and a few platforms and floating islands that serve as resort hotels. Most structures offshore however have been built to support the activities of petroleum industries-activities that include the exploration, drilling, production, storage and transportation of oil. The design of marine structures compatible with the extreme offshore environmental conditions is a most challenging and creative task. Offshore structures include moored or mobile ships whose positions may be precisely controlled. They include the guy lines for compliant towers, the cables for buoys and for tension-leg platforms, and the associated pipelines without which the platforms and submerged oil production systems would be useless.

Offshore mooring systems have variety of configurations. The function of a mooring system is to keep the buoy, ship, or platform structure at a relatively fixed location during engineering operations. These offshore structures are very useful in laying marine pipelines. Because of these offshore structures throughout the world there are at

present about 80,00,000 m of marine pipelines. Since 1986, the rate of building new marine pipelines has been about 10,00,000 m per year. Individual pipelines on the sea floor vary in length from 1 to 10,00,000 m and in diameter from 0.07 to 1.52 m. For instance, a Norwegian project features a 10,00,000 m lien extending from the Troll field to Belgium, which was completed in 1992. At present; Kuwait has the loading line of largest diameter, 1.52 m. The pipelines of smaller diameter are used to transport oil and gas from wellheads, and those of larger diameter are used to load and unload oil from the tankers moored at offshore terminals. The deepest sea floor pipelines at present are the 0.46 m diameter gas lines in the Gulf of Mexico, for which the maximum depth is 1400m.

The development of offshore oil and gas has played an essential role in laying down foundations of the modern world. The design of offshore structures used for oil and gas presents problems, due to environmental hazards from wind and current forces and the weight of the structure.[14]

1.2 PILE FOUNDATION

Pile foundations are the part of a structure used to carry and transfer the load of the structure to the bearing ground located at some depth below ground surface. The main components of the foundation are the pile cap and the piles. Piles are long and slender members which transfer the load to deeper soil or rock of high bearing capacity avoiding shallow soil of low bearing capacity the main types of materials used for piles are wood, steel and concrete. Piles made from these materials are driven, drilled or jacked into the ground and connected to pile caps. Depending upon type of soil, pile material and load transmitting characteristic piles are classified accordingly.

1.2.1 Functions of Pile

Pile foundations are mainly used for:

- To transmit a foundation load to a solid ground
- To resist vertical, lateral and uplift load
- To carry uplift loads when used to support tall structures subjected to overturning forces from winds or waves
- To increase the factor of safety for heavy buildings