**DESIGN OF FLOATING OFFSHORE STRUCTURES**

**2 - Marks**

1. What are the design stages of an offshore platform?
2. What you mean by Front End Engineering Design (FEED)?
3. What are the key design factors of an offshore floating platform?
4. What are the distinguishable characters between different Floaters?
5. What are the two essential functions of any semi-submersible?
6. Differentiate between Hull type and Truss type Deck.
7. Which are the main design criteria to be considered for fixing the size and shape of pontoons of a semi-submersible?
8. Which are the main design criteria to be considered for fixing the size and shape of columns of a semi-submersible?
9. Which are the functions of Transverse and Diagonal space frame bracings of a semi-submersible platform?
10. Which are the main factors that will determine the response a semi-submersible platform to wave action?
11. What will be the approximate air gap required for semi-submersible platform, if the extreme wave height is found to be 8m?
12. What are the two empirical methods used for initial weight estimation of column and pontoon of a semi-submersible?
13. What are the main variable loads in a semisubmersible platform?
14. What is the total/design pressure for a square pontoon keel plate, having a draft of 25m with an internal pressure of 5 bar. Use Empirical relations.
15. What are the environmental loading systems in a semisubmersible platform?
16. Differentiate between a semi-submersible and TLP based on the criteria Bouncy.
17. Define a Tension leg.
18. Differentiate between a dry transportation and wet transportation of an offshore platform.
19. Describe the vertical equilibrium of a TLP.
20. What are the main design elements which will control the Heave and pitch periods of a TLP.
21. Describe the most commonly used deck type in a TLP.
22. Classify the TLPs based on column pontoon arrangement.
23. What you mean by ringing responses in a TLP?
24. Why hydrostatics and stability are not a salient features a TLP, compared to a semi-submersible platform?
25. List out the steps in installation of a TLP.
26. Why the TLPs are not preferred for offshore storage?
27. Describe the size comparison of pontoon and columns of a TLP based for minimum heave response.
28. What you mean by wave run-up in a TLP?
29. Classify SPAR platforms.
30. How vortex induced vibrations are reduced in a SPAR platform?
31. List out the SPAR hull sizing parameters.
32. What are the exclusive advantages of SPAR platform compared to other offshore structures?
33. What are strakes and why they are used in SPAR platforms?
34. Describe the Basic free body diagram for SPAR platform stability.
35. What are the configurations for a bow turret?

**4 - Marks**

1. Why we need different types of offshore platforms?
2. Classify offshore platforms based on the design point of view.
3. What are the factors affecting the concept selection of an offshore platform?
4. List out any five design drawings made during detailed design.
5. Show the comparison of Size and Shape of Semi-submersible, TLP, SPAR and an FPSO with the help of a sketch.
6. With the help of a diagram, define a semi-submersible platform.
7. With the help of sketches, explain the evolution of different generations of Semi- submersible platforms.
8. What are the constraints that we should consider in the initial stages of design of a semi-submersible platform?
9. What are the principle considerations in the design of semi-submersibles platforms?
10. Explain the different configurations of Deck in a semi-submersible platform?
11. Draw any four pontoon-column arrangements in a semi-submersible platform
12. What is the critical point of stability when a semi-submersible is submerging and explains the design shape that is given to column-pontoon joint to reduce this criticality?
13. With the help of a sketch, show the different types of space frame bracings in a semi-submersible platform.
14. Explain different type of mooring system used in semisubmersible with sketches.
15. Differentiate between an integral deck and Independent deck.
16. Explain the cost reduction factors in construction of a semisubmersible column.
17. Explain the steps to determine the Effective Air gap of a semi-submersible platform.
18. Explain the different loading conditions a semi-submersible platform.
19. Describe the General shape pattern for column and pontoon.
20. Explain the gravity-buoyancy load distribution in a twin pontoon semisubmersible platform.
21. What you mean by squeeze/pry environmental loading in a semisubmersible platform?
22. What you mean by racking environmental loading in a semisubmersible platform?
23. With the help of a diagram, define Tension Leg (TLP) platform.
24. What are the advantages and disadvantages of TLPs?
25. Explain the design criterias of a TLP.
26. What you mean by Set down and Offset in a TLP. Explain with the help of a diagram**.**
27. Explain briefly the second order wave forces.
28. Explain the weight and force grouping in a TLP.
29. With the help of a schematic diagram, define a SPAR platform.
30. Differentiate between hard tank and soft tank in a SPAR platform.
31. Differentiate between a Classic SPAR and a Truss SPAR.
32. List out the design criteria for SPAR sizing.
33. Explain the free body diagram for SPAR hull sizing.
34. Explain a pull over drilling.
35. With the help of a schematic diagram, define an FPSO.
36. Explain four principal requirements that drive the size of an FPSO.
37. With the help of a schematic diagram, define an FPSO.
38. List out different type of turret in an FPSO.
39. List out the names of a four famous designers providing FPSO turret design.
40. List out the selection criteria of turret for an FPSO.
41. What are the main design and cost impacts of installing a turret in an FPSO?
42. Describe a Top Mounted Internal Turret.
43. With the help of a schematic diagram, define a Drill ship.
44. What are the design considerations of a Drill ship?
45. Explain the total strength assessment of a drill ship.

**14 - Marks**

1. Explain the different design stages of an offshore platform.
2. Explain the design spiral for an offshore production system.
3. Explain the configurational components of a semi -submersible platform.
4. Explain the governing factors determining the sizing of a semisubmersible platform.
5. Explain the hull weight and force break down of a semisubmersible.
6. Consider a closed array square pontoon semi-submersible platform. Pontoon – 85\*22\*15 m (l\*b\*d) and Column – 22\*22\*L m. Draft required for operating condition = 27.5m( called design draft). Draft required in Transit condition = 12m. Environmental condition – A 100 yr wave analysis gives a maximum wave height of Hmax = 18m. Initial weight estimation gives 80000 tones platform weight and KG as 25m

(a) Find the air gap required (As per API RP2SK), for operating condition. Find the Length of Columns.

(b) Find the displaced volume and Metacentric Height (GM) for operating and Transit conditions.

1. Consider a closed array square pontoon semi-submersible platform. Pontoon – 85\*22\*15 m (l\*b\*d) and Column – 22\*22\*L m. Draft required for operating condition = 27.5m( called design draft. GM required for survival condition = **6m.** Air gap given = 9.6m. Initial weight estimation gives 80000 tones platform weight. Assume that due to survival conditions, we removed same amount of weight from the deck to maintain the draft as same. If KG is found to be 25m, take decisions on ballast requirement of **pontoons alone** in survival conditions. If needed, find the amount of ballast required, assuming pontoons are simple void spaces (permeability is 100%).
2. Consider a closed array pontoon circular column semi-submersible platform. Column having radius 10m and length of L m. Pontoon – 85\*22\*15 m (l\*b\*d). Draft required for operating condition = 27.5m( called design draft). Draft required in Transit condition = 12m. Environmental condition – A 100 yr wave analysis gives a maximum wave height of Hmax = 18m. Initial weight estimation gives 80000 tones platform weight and KG as 25m.

(a) Find the air gap required (As per API RP2K), for operating condition. Find the Length of Columns.

(b) Find the displaced volume and Metacentric Height (GM) for operating and Transit conditions.

1. Find the ratio of metacentric heights of two semi-submersible platforms given below.
	1. Closed array square pontoon with circular columns of diameter 5m.
	2. Closed array square pontoon with square columns of side 5m.

Assume both semisubmersibles have same volume displacement of 5000m3 and their center of buoyancy and center of gravity coincides. The center to center distance between columns was found to be 20m for both semisubmersibles

1. Explain the different load cases to be considered while designing for Local and Global strength of a semi-submersible platform and how they are done?
2. Explain the configurational components of a TLP.
3. Explain TLP mechanics with the help of diagrams.
4. Explain the stages in initial design process of a TLP.
5. Explain SPAR Riser and Mooring system.
6. Explain the stages in a SPAR installation.
7. Explain the Deck and Hull structure of an FPSO.
8. Explain the turret selection and design of an FPSO.
9. Explain different types of bow turret configurations.
10. What are the provisional and safety requirements in a turret area of an FPSO?
11. Explain the fatigue strength assessment of a Drill ship.