



**PRESIDENCY UNIVERSITY
BENGALURU**

**SCHOOL OF ENGINEERING
END TERM EXAMINATION - JAN 2023**

Semester : Semester III - 2021

Course Code : PET2003

Course Name : Sem III - PET2003 - Fundamentals of Oil and Gas Well Drilling Technology

Program : B.Tech. Petroleum Engineering

Date : 11-JAN-2023

Time : 1.00PM -
4.00PM

Max Marks : 100

Weightage : 50%

Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Question paper consists of 3 parts.
- (iii) Scientific and non-programmable calculator are permitted.

PART A

ANSWER ALL THE TEN QUESTIONS

10 X 2 = 20M

1. Define the following terms with reference to Drilling Engineering:
 - a) Duplex Pumps
 - b) Triplex Pumps

(CO1) [Knowledge]
2. What are the names of Drilling rigs used for drilling in Offshore environments?

(CO1) [Knowledge]
3. Emma stated that "Slick Drill Collars reduces the chances of differential sticking". This statement was contradicted by Sam who stated that "Spiral Drill Collars reduces the chances of differential sticking". Identify which one of them is correct and why?

(CO2) [Knowledge]
4. List out the functions of Heavy Weight Drillpipe in context of drill string design.

(CO2) [Knowledge]
5. List out the functions of Drill String.

(CO2) [Knowledge]

6. Match the following additive with respect to drilling fluid:
- | | |
|-------------------|----------------------|
| 1) Bentonite | A) Shale Inhibitor |
| 2) Haemetite | B) Viscosifier |
| 3) KCl | C) Biocide |
| 4) Glutaraldehyde | D) Weighing Additive |
- (CO1) [Knowledge]
7. Match the following with respect to load cases for Tension Design of Casing:
- | | |
|--------------------------------|---|
| 1) Running Conditions | A) Buoyant weight + Pressure testing force +Bending force |
| 2) Static Conditions | B) Buoyant weight + Shock load +Bending force |
| 3) Pressure Testing Conditions | C) Buoyant Weight + Bending Force |
- (CO3) [Knowledge]
8. List out different types of casing employed in well drilling. In which casing, BOP is placed?
- (CO3) [Knowledge]
9. Match the following with the correct options for cutting mechanisms employed by drilling bits:
- | | |
|--|--------------------------|
| 1) Roller cone Bit | A) Compression |
| 2) PDC Bit | B) Long and sharp teeth |
| 3) Formation with low compressive strength | C) Short and Wider Teeth |
| 4) Consolidated Formation | D) Shear |
- (CO4) [Knowledge]
10. Describe the following with respect to Roller cone bits:
- a) Milled Tooth Bits
b) Insert Bits
- (CO4) [Knowledge]

PART B

ANSWER ALL THE FOUR QUESTIONS

4 X 10 = 40M

11. Duplex Pumps are double acting pumps while Triplex Pumps are single acting pumps. Triplex Pumps are more lighter and compact than duplex pumps. Concerning the above statements which pumps are commonly employed for the circulation of mud. Justify your answer with proper statements. Compare Duplex Pumps with respect to Triplex Pumps in terms of their design criteria. Also comment on the pump type that are most common in drilling operations.
- (CO1) [Comprehension]
12. Weight on the Bit, or WOB, as expressed in the oil industry, is the amount of downward force exerted on the drill bit provided by thick-walled tubular pieces in the drilling assembly that are known as drill collars. The downward force of gravity on these steel tubes provide force for the drill bit in order to effectively break the rock. Weight on bit should be less than buoyant weight of drill collar. Describe the above statement along with consequences that can happen when WOB is kept higher than the drill collar weight .
- (CO2) [Comprehension]
13. Casing design involves the determination of factors which influence the failure of casing and the selection of the most suitable casing grades and weights for a specific operation, both safely and economically. Before designing casing, the essential data must be obtained from various sources including: geologists, petrophysicists, reservoir engineers etc. Discuss and classify the forces that are taken into consideration while designing the casing.
- (CO3) [Comprehension]

14. A drilling bit is used to cut the rocks. Bits can be classified depending on the drilling mechanism. PDC bit works using stationary blades and shearing mechanism. For drilling a soft formation high length blades with long tooth are used. Give an appropriate reason for the given statement and explain it with an example.

(CO4) [Comprehension]

PART C

ANSWER ALL THE TWO QUESTIONS

2 X 20 = 40M

15. A rig must hoist a load of 300000 lbf. The drawworks can provide an input power to Block and Tackle System as high as 500 hp. Eight lines are strung between the crown block and the traveling block. Efficiency of the whole system is 0.841. Calculate the following:
- Static Tension in the fast line when upward motion is impending,
 - Maximum hook horsepower available,
 - Maximum hoisting speed,
 - Time required to pull a 90 ft stand.

(CO1) [Application]

16. Calculate the tensile forces for the following casing string in running conditions and static conditions.

20 "casing, ID = 18.71 inch

$W_n = 133$ lb/ft

CSD = 2800 ft (Total Depth = 5000 ft)

Mud weight = 10 ppg

Test Pressure = 2500 psi

Dogleg = 0.75 deg/100 ft

Also evaluate the pressure testing force using the above data.

(CO3) [Application]
