Name:

Enrolment No:

UPES
End Semester Examination, December-2024

Programme Name: B.Tech **Semester: III**
Course Name: Fundamentals of Drilling Engineering **Time: 3 hrs**
Course Code: PEAU 2023 **Max. Marks: 100**

Instructions:

- **All questions are compulsory.**

However, internal choice has been provided. You must attempt only one of the alternatives in all such questions.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Define HWDP, mechanical advantage, reamers and swivel.	**04**	**CO1**
Q 2	Define specific energy and cost per foot of drilling.	**04**	**CO1**
Q 3	Distinguish shoveling and shearing action mechanism.	**04**	**CO2**
Q 4	Discuss the functions of any two components used in bottom hole assembly.	**04**	**CO2**
Q 5	Discuss IADC bit pattern with example.	**04**	**CO2**

SECTION B
(4Qx10M= 40 Marks)

Q 6	Draw the flow diagram of a "Mud Circulation System and explain any two properties of a drilling fluid and illustrate their importance. **OR** Sketch the hoisting system and discuss five components of hoisting system with their functions.	**10**	**CO2**
Q 7	Explain the importance of gel strength, densifiers, rheology control materials and loss circulation materials in drilling fluids.	**10**	**CO3**
Q 8	Discuss the design factors and selection criteria for a TCR bit with examples.	**10**	**CO3**
Q 9	Distinguish between drag bit and PDC bit with examples	**10**	**CO3**

SECTION-C (2Qx20M=40 Marks)			
Q 10	a) Calculate the liner size required for a double-acting duplex pump where rod diameter is 3.0 in, stroke length is 25 in stroke; pump speed is 75 strokes/min. In addition, the maximum available pump hydraulic horsepower is 1500 hp. For optimum hydraulics, the pump recommended delivery pressure is 3,500 psi. Assume the volumetric efficiency of pump is 98%. b) A block and tackle system has 10 lines with efficiency of 0.81. The system can lift a maximum load of 600,000 lbf at a speed of 100 ft/min. The diameter of drawworks drum is 30 inches. Calculate the fast line and dead line tensions, fast line and drum speeds, and the torque in the drum when no drilling line is reeled in the drum **OR** i. Discuss the derrick load, derrick efficiency factor & mechanical advantage in ideal condition and in case of friction. ii. During a drilling rig structure fatigue test, the operator measured the wind load of 0.5 psi. The rig has ten lines which are strung through the traveling block. A hook load of 250,000 lbf is being hoisted. According to the API standard, calculate the wind velocity, and the total compressive load.	**10+10**	**CO4**
Q 11	a) The hoisting system of a rig derrick has a load of 550,000 lbf. The input power of the draw works for the rig can be a maximum of 590 hp. Eight drilling lines are strung between the crown block and traveling block. Consider there is some loss of power due to friction within the hoisting system. Compute: (1) the static tension in the fast line when upward motion is impending, (2) the mechanical advantage of the block and tackle, (3) the maximum hook horsepower available, (4) the maximum hoisting speed, (5) if a 80 ft stand is required to be pulled, what should be the required time, (6) the actual derrick load, (7) the maximum equivalent derrick load, and (8) the derrick efficiency factor b) Distinguish the computerized rig and mechanical rigs based on their applications.	**15+5**	**CO5**