Name: **Enrolment No:**	

UPES
End Semester Examination, December 2023

Programme Name: B.Tech APE UP **Semester: III**
Course Name: Drilling Engineering **Time: 3 hrs**
Course Code: PEAU 2014 **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	If a well encounters problems during drilling and due to this problem, the approved budget fails, which two decisions should be made?	**04**	**CO1**
Q 2	Define PDC bits and major components of bit design.	**04**	**CO2**
Q 3	Distinguish non-dispersed inhibited and dispersed non-inhibited fluids.	**04**	**CO1**
Q 4	Discuss the functions of any two components used in bottom hole assembly.	**04**	**CO1**
Q 5	Discuss journal angle & scrapping and gauging mechanism.	**04**	**CO2**

SECTION B
(4Qx10M= 40 Marks)

Q 6	Explain the types of drilling fluids and discuss about the viscosifiers, rheology control materials and filtration materials	**10**	**CO2**
Q 7	Draw the flow diagram of a "Mud Circulation System and explain any two properties of a drilling fluid and illustrate their importance. **OR**	**10**	**CO3**

	Sketch the hoisting system and discuss five components of hoisting system with their functions	**10**	**CO3**
Q 8	Discuss the milled tooth and TC insert tooth bits. Also comments on specific energy and cost per foot of drilling	**10**	**CO3**
Q 9	Distinguish between drag bit and roller cone bit. Also discuss the design criteria for rolling cutter bits	**10**	**CO4**
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 single-acting triplex pump has been used in a drilling rig to provide a total pump rate of 750 gals/min at pressure of 1800 psi and pump speed of 100 strokes/ min. If the liner diameter is 6 inches, determine the liner length and the pump output power. Assume a displacement efficiency of 95%	**10+10**	**CO5**
Q 11	a) The hoisting system of a rig derrick has a load of 350,000 lbf. The input power of the draw works for the rig can be a maximum of 530 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 90 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**	**CO6**

	OR		
	i. During a rig structure fatigue test, the operator measured the wind load of 0.6 psi. The rig has sixteen lines which are strung through the traveling block. A hook load of 550,000 lbf is being hoisted. According to the API standard, calculate the wind velocity, and the total compressive load. Also discuss the derrick load, derrick efficiency factor & mechanical advantage in ideal condition and in case of friction.		
	ii. A diesel engine is run to generate power for the rig system. It gives an output torque rating of 1,500 ft-lbf at an engine speed of 1,170 rpm. Consider that there is a friction loss in the pulley and block and tackle system. The hook load of the rig is 580,000 lbf and there are ten drilling lines strung on the system. Find the output power of the engine, velocity of the fast line, tension of the fast line, velocity of the traveling block, power output of the block and tackle, efficiency of block and tackle.	**10+10**	**CO6**