Name: Enrolment No:	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2018

Course: **Drilling Hydraulics (PEAU 2003)** **Semester: III**
Programme: **B.Tech GSE/GIE**
Time: 03 hrs. **Max. Marks: 100**

Instructions: Be brief and to the point. Use calculator, mention appropriate sign convention and unit. Draw diagrams using pencil and ruler, wherever necessary with proper labelling.

SECTION A

S. No.		Marks	CO
Q 1	List the different types of Drilling Fluids and their advantages.	**4**	**CO1**
Q 2	Illustrate with the help of a family tree, different types of fluid models.	**4**	**CO2**
Q 3	Define Equivalent Circulation Density concept using mathematical expression.	**4**	**CO3**
Q 4	Discuss the types of drilling programs based on pressure balance between the borehole and formation pressures.	**4**	**CO4**
Q 5	Discuss the various chemical additives used to control properties of drilling fluids based on borehole formation types.	**4**	**CO5**

SECTION B

Q 6	Describe the various functions of drilling fluids.	**8**	**CO1**
Q 7	Illustrate the concept of nozzle velocity with diagram. Prove that pressure drop across nozzle, $\Delta P = (V_n^2 * \rho)/1.805$ OR Describe the process of nozzle selection for optimization of flow rate. Define Reynolds number.	**4+4=8**	**CO2**
Q 8	Derive the Hagen-Poiseuille equation for pressure drop in Bingham Plastic Model. Hagen-Poiseuille Equation: $\Delta p = (32000 L \mu_e v)/D^2$ N/m^2	**8**	**CO3**
Q 9	With the help of a neat schematic diagram, describe the various pressure drop encountered in a Mud Circulation System. Determine mathematically the pressure available at bit. OR Explain the process to calculate the annular and pipe volumes in and around drill pipe, drill colar in cased and open hole. Draw a neat schematic diagram to support the mathematics.	**8**	**CO4**
Q 10	Discuss Impact Force hydraulic criterion. Calculate IF for Q = 700gpm; Mud Weight = 9ppg; P_{bit} = 980 psi.	**4+4=8**	**CO6**

SECTION-C

Q 11	It is required to reduce the mud weight from 25.1 ppg to 22.6ppg. Calculate the volumes of water and oil required to bring about this reduction. Also if oil is used, what is the percentage of oil in mud if the initial volume of mud is 629 bbl. The	**20**	**CO5**

	density of oil is 6.87ppg. (Solve in either metric or imperial units)		
Q 12	For a section of 12 ¼ inch hole. Given that: Pumping Rate, Q = 700gpm; PV = 12Cp; YP = 12 lb/100ft^2; Mud weight = 8.824ppg; Drill pipe OD:ID = 5inch:4.276inch ; Drillpipe length = 6480ft; Drill collar OD:ID = 8inch:2.876 inch; Drillcollar length = 620ft. Last casing was 13.375 inch OD with ID 12.565 inch. Maximum Pump pressure = 2200 psi. Surface Equipment Type, E = 4.2 x 10^{-5}.	**20**	**CO3**
	Determine the various pressure drops, nozzle velocity and nozzle sizes using **Bingham Plastic Model** from the above data.		
	OR		
	Determine the various pressure drops, nozzle velocity and nozzle sizes using **Power Law Model** from the above data.		