Name:

Enrolment No:

UPES
UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Course: Mechanics of Drilling Engineering **Semester: 3rd**
Program: B.Tech - Applied Petroleum Engineering - Upstream **Time 03 hrs.**
Course Code: PEAU 2006 **Max. Marks: 100**

Instructions: Attempt all the questions.

SECTION A

S. No.		Marks	CO
Q 1	Discuss the major causes of differential sticking, suggest remedies for the same.	**4**	**CO1**
Q 2	What is kick? How to identify the kick and write its controlling techniques.	**4**	**CO2**
Q 3	Explain formation isolation test and formation integration test.	**4**	**CO3**
Q 4	What are the parameters affecting the drill string design?	**4**	**CO3**
Q 5	Describe the conditions for drill string failure due torsion, burst, and collapse	**4**	**CO4**

SECTION B

Q 6	A mud sample in a rotational viscometer equipped with a standard torsion spring gives a dial reading of 46 when operated at 600 rpm and a dial reading of 28 when operated at 300 rpm. Computed the apparent viscosity of the mud at each rotor speed. Also compute the plastic viscosity and yield point.	**10**	**CO1**
Q 7	Why various types of well profile are used in directional drilling? Explain KOP and BUR.	**10**	**CO5**
Q 8	The following data refer to a directionally drilled well: TVD of station 1 = 1150 ft Northing coordinate of station 1 = 350 ft Easting coordinate of station 1 = 550 ft Survey data at two stations are as follows: Use the radius of curvature method to calculate Increment of northing co-ordinate (ΔN) and Increment of easting co-ordinate (ΔE) at station 1 and 2.	**10**	**CO5**

Station	Measured Depth (ft)	Inclination (I)	Corrected Azimuth (A)
1	1200	15	45
2	1400	19	55

Q 9	Determine the maximum permissible dog leg which will not result in fatigue damage in the following case: Grade S: Drill Pipe 5" OD 4.276"ID, weight 19.5 lb/ft, Tension loads: 225 lb at 2500 ft and 233,035 lb at 2000 ft **OR** A drill string is composed of 7,000 ft of 5-in., 19.5-lbm/ft drill pipe (internal diameter of pipe is 4.276) and 500 ft of 8-in. OD by 2.75-in ID drill collars when drilling a 9.875-in. borehole. Assuming that the borehole remains in gauge, compute the number of pump cycles required to circulate mud from the surface to the bit and from the bottom of the hole to the surface if the pump factor is 0.178 bbl/cycle.	**10**	**CO2** **CO4**
SECTION-C			
Q 10	The following data refers to a drill string stuck at the drill collars: Drill pipe: 10,000 ft, 5/4.276 in Grade E 19.5 lbm ft, Class 2. Drill collars: 600 ft, total weight 80,000 lb. Make-up torque for drill pipe tool joints = 20,000 ft-lb and the free point is at 9,900 ft. Determine the maximum torque that can be applied at the surface without exceeding the maximum torsional yield strength of drill pipe.	**20**	**CO3**
Q 11	A 3.5 in drill pipe, 13.3 lbm/ft. Grade S135 premium class, is used to run a 4.5 in OD liner to 21,000 ft. If the length of drill pipe is 175,000 ft, the mud weight is 16 ppg and the total weight of the liner is 50,000 lb, calculate the total stretch in the drill pipe. **OR** Determine the maximum permissible dog leg which will not result in fatigue damage in the following case: Grade S: Drill Pipe 5" OD 4.276"ID, weight 19.5 lb/ft Depth 5500 ft; Tension load is 180,414 lb at 5500 ft. Calculate the following: a) Calculate the tension stress at depth of interest b) Calculate the maximum permissible bending stress for grade S pipe c) Determine K d) Calculate the maximum permissible dog leg severity	**5+5+3 +7 =20**	**CO4** **CO2**