Roll No: | | | | | | | | | | | |

PRESIDENCY UNIVERSITY

GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

Presidency University Act, 2013 of the Karnataka Act No. 41 of 2013 | Established under Section 2(f) of UGC Act, 1956
Approved by AICTE, New Delhi | Approved By BCI
Bengaluru

Mid Term Examinations - October 2026

Date: 08/10/2026 **Time:** 11:45 AM - 01:15 PM

Course Code: MAT2305 **Course Name:** Advanced Statistics for Petroleum Engineers

Semester: Fifth Semester **Max. Marks:** 50 **Weightage:** 50%

CO - Levels	CO1	CO2	CO3
Marks	24	22	44

PART A: Answer Following Questions. 10 M

Q.N.	Questions	M	CO	BT
1	What is the hierarchy of petroleum accumulation classification?	2	CO1	BT2
2	What is a tree diagram? Give one example.	2	CO1	BT2
3	Define relative frequency and cumulative frequency.	2	CO2	BT2
4	Define a random variable with one example.	2	CO3	BT2
5	Define a continuous random variable with one example.	2	CO3	BT2

PART B : Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT
6	In a certain deep water drilling field, the prior probability of getting a stuck pipe while tripping out of the hole is 12% (P(Stuck) = 0.12). A new real-time torque-and-drag monitoring AI is tested. When the pipe is about to get stuck, the AI sends an "Alert" signal 85% of the time. When the pipe is not going to get stuck, the AI falsely sends an "Alert" 10% of the time. The AI just sent an "Alert". What is the probability that the pipe will actually get stuck if you ignore the alert and continue tripping?	10	CO1	BT3
7	A production well has a downhole water cut sensor that is not perfectly reliable. Historically, when the true water cut is high (>80%), the sensor reads "High" 90% of the time. When the true water cut is low (<80%), the sensor falsely reads "High" 15% of the time. Based on the reservoir's maturity, you believe there is a 40% prior probability that this well's water cut is actually high. The sensor just sent a "High" reading. What is the posterior probability that the well's water cut is truly high? Should you consider shutting off this well?	10	CO1	BT3

PART C: Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT
8	Oil and mixed oil and gas field sizes Oil and mixed oil and gas field sizes (in million barrels known recovery) for 125 fields of 1 million BOE or more known recovery in the northern Michigan Silurian reef play are given below.	10	CO2	BT3

CI	0,0.5	0.5, 1.0	1.0, 1.5	1.5,2.0	2.0,2.5	2.5, 3.0	3.0, 3.5	3.5, 4.0	4.0,4.5	4.5, 5.0	5.0, 5.5	5.5, 15
f	2	5	8	12	18	25	17	13	10	7	5	3

Find the relative frequency, Cumulative frequency (less than & greater than). Find the median field size from the graph.

9	A petroleum geologist has collected field size data for 200 fields in the northern Michigan Silurian reef play as given below. CI | 0,0.5 | 0.5, 1.0 | 1.0, 1.5 | 1.5,2.0 | 2.0,2.5 | 2.5, 3.0 | 3.0, 3.5 | 3.5, 4.0 | 4.0,4.5 | 4.5, 5.0 | 5.0, 5.5 | 5.5, 15 f | 13 | 58 | 45 | 22 | 14 | 9 | 12 | 8 | 4 | 6 | 5 | 4 As a reservoir analyst, you are required to calculate the relative frequency for each class. Determine how many fields have recovery below and above certain thresholds using cumulative frequency. Also find the median from the graph.	10	CO2	BT3

PART D: Answer Any 1 Following Questions. 10 M				
Q.N.	**Questions**	**M**	**CO**	**BT**
10	Describe the mean, moments, variance and Standard deviation using mathematical expectation of a discrete random variable.	10	CO3	BT3
11	Describe the mean, moments, variance and standard deviation using mathematical expectation of a continuous random variable.	10	CO3	BT3

PART E: Answer Any 1 Following Questions. 10 M				
Q.N.	**Questions**	**M**	**CO**	**BT**
12	A discrete random variable X has a binomial distribution and represents the number of successes in a series of trials. Its probability distribution is shown partially in the table below. x | 0 | 1 | 2 | 3 P(X=x) | 0.512 | 0.384 | 0.096 | 0.008 Explain the following i) Check whether the table qualifies as a legitimate pmf by testing the necessary criteria. ii) Build the "less than" cumulative distribution and the "more than" complementary cumulative distribution, each as a piecewise function defined for every real x. iii) Discuss the shape, features, and interpretation of the graphs plotted from this discrete probability distribution.	10	CO3	BT3
13	Let X be a continuous random variable that is uniformly, or rectangularly, distributed function on the interval [a, b] as given below. $f(x) = \begin{cases} \frac{1}{b-a} & \text{for } a \le x \le b \\ 0 & \text{otherwise} \end{cases}$ i) Express the probability density function f(x) for this uniform distribution in piecewise form. ii) Express the "less than" cumulative distribution and the "more than" complementary cumulative distribution as piecewise-defined functions. iii) Describe the graphical shape of the CDF when the underlying distribution is continuous and uniform.	10	CO3	BT3