Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

Mid - Term Examinations – October 2025

Date: 10-10-2025 **Time:** 11.45am to 01.15pm

School: SOE	**Program:** B.Tech. (PET)	
Course Code: PET2014	**Course Name:** Geophysical Methods for Oil and Gas Exploration	
Semester: V	**Max Marks**: 50	**Weightage**: 25%

CO - Levels	CO1	CO2	CO3	CO4	CO5	CO6
Marks	14	24	12			

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2 marks. **5Q x 2M=10M**

1.	Describe how a limestone can transform into marble.	**2 Marks**	**L2**	**CO1**
2.	Summarize the Van Krevelen diagram used to classify kerogen types.	**2 Marks**	**L2**	**CO1**
3.	Explain how changes in fossil types across a stratigraphic column can indicate past depositional environments favorable for hydrocarbons.	**2 Marks**	**L2**	**CO2**
4.	Summarize how fossil assemblages help in correlating and dating petroleum reservoirs.	**2 Marks**	**L2**	**CO2**
5.	A company with limited funds needs a low-cost reconnaissance tool. Recognize two benefits of geochemical prospecting in this situation.	**2 Marks**	**L2**	**CO3**

Part B

Answer the Questions. **Total Marks 40M**

6.	**a.**	(i) Explain how Capillary pressure plays significant role in migrating hydrocarbon from source rock to the reservoir rock. (ii) Sketch the generalized curve for capillary hysteresis.	**5+5 Marks**	**L2**	**CO1**
	b.	During a field investigation of a sedimentary basin, geologists recover fossils with differing preservation states: some fossils	**5+5 Marks**	**L3**	**CO2**

		retain delicate original biological structures, while others are heavily mineralized or completely replaced. Using your understanding of fossilization processes, (i) Determine the factors and theories that account for these variations in preservation. (ii) Explain the processes that lead to the retention of original structures versus complete mineral replacement with examples.			
		Or			
7.	**a.**	A newly explored sedimentary basin shows indications of hydrocarbons in several wells. (i) Describe the key elements of a petroleum system present in the basin. (ii) Explain the role of each element in the formation, migration, and accumulation of hydrocarbons.	**5+5 Marks**	**L2**	**CO1**
	b.	A recently explored sedimentary region consists of several basins with varying organic compositions: In one basin, core samples show extensive coal seams, and in an adjacent basin, liquid hydrocarbons have been recovered. Using your understanding of fossil evidence and hydrocarbon formation. (i) Predict, which fossil types are most likely associated with each basin, and justify your choices based on the depositional environment. (ii) Determine the process of formation for these fossils and how they relate to the generation of hydrocarbons in each setting.	**5+5 Marks**	**L3**	**CO2**
8.	**a.**	Core and well-cutting analysis from a sedimentary interval reveal abundant benthic foraminifera, suggesting deposition in shallow marine conditions. In a nearby frontier basin, surface surveys detect localized seepages of oil and gas along fault lines. (i) Using the fossil evidence, estimate whether the shallow marine interval is more likely to represent a reservoir rock or a source rock, and justify your reasoning. (ii) Summarize your understanding of petroleum migration to explain how the observed surface oil and gas seepages might indicate the presence and location of subsurface petroleum accumulations.	**5+5 Marks**	**L2**	**CO2**

	b.	Scenarios: (a) A geologist is investigating a sedimentary region where no obvious surface hydrocarbon indications are visible. (b) An adjacent unexplored basin has very limited seismic coverage, and the company wants to minimize exploration costs. (i) Apply your knowledge of direct and indirect geochemical methods to recommend the most suitable approach for detecting hydrocarbons in the region without surface indications and justify your choice. (ii) Determine how geochemical prospecting can be used in the unexplored basin to reduce exploration costs and risks before drilling, citing specific methods and their advantages.	**5+5 Marks**	**L3**	**CO3**
		Or			
9.	**a.**	Scenario: (a) In a deep offshore basin, seismic surveys indicate potential hydrocarbon traps, but exploratory drilling is very expensive. (b) Geochemical survey data from soil and sediment samples show variations influenced by both sedimentary and biological processes. (i) Apply your knowledge of geochemical exploration to explain how it can reduce exploration risks in high-cost drilling areas, and evaluate the limitations and uncertainties that must be considered before deciding to drill. (ii) Using the concept of zones of maximum disturbance, explain how sedimentary and biological processes affect geochemical survey results. Include a well-labelled diagram to support your explanation.	**5+5 Marks**	**L3**	**CO3**
	b.	A petroleum exploration team collects well cores and geochemical data from multiple basins. (a) Fossil assemblages are observed in the cores, showing variations in species across stratigraphic intervals. (b) Rock-Eval analysis of shale samples provides Hydrogen Index (HI) and Oxygen Index (OI) values for the source rocks. (i) Using the fossil evidence, explain how fossil assemblages can be applied to correlate and date petroleum reservoirs across different wells.	**5+5 Marks**	**L2**	**CO2**

		(ii) Describe the meaning of HI and OI values on a Van Krevelen diagram and explain how these indices help assess kerogen type and hydrocarbon potential.			