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**PRESIDENCY UNIVERSITY
BENGALURU**

**SCHOOL OF ENGINEERING
END TERM EXAMINATION - JAN 2023**

Semester : Semester III - 2021

Course Code : PET1001

Course Name : Sem III - PET1001 - Petroleum Geology

Program : B.Tech. Petroleum Engineering

Date : 5-JAN-2023

Time : 1.00PM - 4.00PM

Max Marks : 100

Weightage : 50%

Instructions:

- (i) Read all questions carefully and answer accordingly.*
 - (ii) Question paper consists of 3 parts.*
 - (iii) Scientific and non-programmable calculator are permitted.*
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PART A

ANSWER ALL THE TEN QUESTIONS

10 X 2 = 20M

1. Weathering and erosion are sometimes misjudged by thinking that they are the same thing or somewhat similar. But the fact is weathering and erosion are completely different actions with different mechanism. Outline between weathering and erosion.
(CO1) [Knowledge]
2. Name any two out of four elements considered essential for life to exist and continue on the Earth.
(CO1) [Knowledge]
3. The atmosphere, hydrosphere, and biosphere envelope the earth. The structure of the atmosphere consists of five basic layers, i.e., Mesosphere, Stratosphere, Troposphere, Exosphere, and Ionosphere. Arrange all five layers in order of their existence starting from the surface of the earth.
(CO1) [Knowledge]
4. Describe the importance of shale formation in conventional and unconventional petroleum system.
(CO2) [Knowledge]
5. Define 'Petroleum'.
(CO2) [Knowledge]
6. List out any two factors that control or affect the depositional processes and sediment characteristics.
(CO3) [Knowledge]
7. List down the primary composition of siliciclastic rocks.
(CO3) [Knowledge]
8. List of two Sedimentary Basins of India which are upgraded as Category II Basins from Category III Basins by DGH.
(CO3) [Knowledge]

9. Name any two Sedimentary Basins of India which are listed under Category I Basins by DGH.
(CO3) [Knowledge]
10. The fining and coarsening upward sediment sequences are developed due to marine _____ and _____ processes respectively.
(CO3) [Knowledge]

PART B

ANSWER ALL THE FOUR QUESTIONS

4 X 10 = 40M

11. The Mid-Atlantic Ridge is a mid-ocean ridge located along the floor of the Atlantic Ocean, and part of the longest mountain range in the world. In the North Atlantic, the ridge separates the North American from the Eurasian Plate and the African Plate, north and south of the Azores Triple Junction respectively. (a) Recognize the type of plate boundary created along the floor of the Atlantic Ocean. (b) Predict at least two consequences that may take place due to the creation of this kind of plate boundary.
(CO1) [Comprehension]
12. A fresh petroleum graduate was working as a trainee engineer in a relatively new oil and gas company. Being new to the company, the trainee engineer got the opportunity to be trained in multiple disciplines under experts. He was working on a drilling rig where multiple reservoirs were predicted at different depths. Before reaching to the last reservoir, he noticed that graphite cuttings were coming out continuously from the well along with drilling mud. After ensuring that the drill bit had punctured a graphite bed, he immediately instructed the driller to stop drilling and informed the same to his reporting manager. Later, the trainee engineer and his reporting manager convinced their company personnel that the petroleum reservoir can't exist below that depth and therefore, no need to drill further. As this timely decision saved huge money for the company, they were appreciated well with awards. Predict the reason(s) cited for not continuing drilling till the target depth in that particular well.
(CO2) [Comprehension]
13. Sedimentary basins are region-scale depressions of the Earth's crust where subsidence has occurred and a thick sequence of sediments has accumulated to form a large three-dimensional body of sedimentary rock. Sedimentary basins are formed over hundreds of millions of years by the combined action of deposition of eroded material and precipitation of chemicals and organic debris within the water environment. Explain the mechanism of sedimentary basin formation with a diagram.
(CO3) [Comprehension]
14. Plate tectonics provides a first-order control on sedimentation through its influence on the sediment source area. The kinds of basins in which sediments accumulate are also directly related to tectonic processes. For example, some basins form as a result of tectonic processes that produce faulting; others are sag basins created by crustal cooling and subsidence or other tectonic processes. In any case, tectonic forces control the shape, and location of the basins. Tectonic processes, together with sediment loading, further determine the rate of basin subsidence and thus the space available (accommodation) for sediment accumulation. Plate-tectonic processes bring about major changes in continental masses and ocean basins through time. Continents break up and drift apart to create ocean basins as much as 500 km wide, which can subsequently close again as the ocean-floor crust is subducted in trenches. Explain the Wilson Cycle with reference to the above comment.
(CO3) [Comprehension]

PART C

ANSWER ALL THE TWO QUESTIONS

2 X 20 = 40M

15. The trap is the stratigraphic or structural feature that ensures the juxtaposition of the reservoir and the seal that hydrocarbons remain trapped in the subsurface, rather than escaping (due to natural buoyancy) and bearing loss. Trapping is the mechanism by which migration of oil and gas is stopped such that an accumulation of these liquids occurs. The identification of traps is one of the most important tasks of the exploration geologist.
- (a) Identify the type of trap(s) present in Figure 1.
 - (b) Sketch an economical drilling plan for Figure 1 to recover maximum hydrocarbons.
 - (c) Write the logic for proposing the above drilling plan.

(CO2) [Application]

16. Naturally fractured reservoirs are in general more sensitive to changes in stress or geomechanical behaviour when fracture aperture or permeability is strongly influenced by rock deformation in fractured rock. Naturally fractured reservoirs are different from conventional (unfractured) reservoirs. They are heterogeneous in type and consist of matrix blocks separated from one another by the fracture system. Now-a-days, fractured igneous basements are also sometimes studied and drilled in the search for oil and natural gas. Predict the probable situation due to which even the igneous basement is drilling for oil and gas exploration.

(CO2) [Application]
