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**UNIVERSITY OF PETROLEUM
AND ENERGY STUDIES**

End Semester Examination, December 2017

Program/course: B. Tech Geoscience/ Geoinformatics [GSE &GIE]	Semester –	V
Subject: Applied Geology	Max. Marks	: 100
Code : EASC 205	Duration	: 3 Hrs.
No. of page/s: 3		

(Draw correct diagram whenever necessary)

SECTION A (Attempt all)

4x5=20marks

1. Multiple choice questions:
 - a) In which of the following formation coal is interbedded with sandstone
 - i. Cambay,
 - ii. Kalol
 - iii. Tarapur,
 - iv. None
 - b) When gas replaces oil in a clean sandstone, Density Neutron log separation:
 - a) Increases
 - b) Decreases
 - c) Remains the same
 - c) In the current ripple
 - i. The chest are pointed but trough are rounded
 - ii. The chest are rounded but trough are pointed
 - iii. Both the chest and trough are pointed
 - iv. Both the chest and trough are rounded
 - d) SP log shows more positive deflection in sandstone if
 - i. $R_{mf}=R_w$
 - ii. $R_{mf}<R_w$
 - iii. $R_{mf}>R_w$
 - iv. None
 - e) Deep resistivity will show lower conductivity than invaded zone when you are using
 - i. Water base mud
 - ii. Oil base mud
 - iii. Both
 - iii. I do not know
2. Explain the role of remote sensing techniques in identifying and mapping gas seepages.
3. What are the main uses of gravity methods in petroleum exploration?
4. Discuss the role of seismic wave in subsurface geology understanding.

SECTION B

[4x10=40marks]

5. Discuss the techniques require to analyze source to reservoir correlation. [10]
6. “A geological model is a spatial representation of the distribution of sediments and rocks in the subsurface. The model is traditionally presented by 2D cross-sections, but increasingly visualized as digital 3D models.”
 - (a) Discuss the tools and techniques used in geological modelling. [5]
 - (b) Analyze seismic and well log methods in geological modelling. [5]
7. What are the different types of well logs? How will you assess the reservoir quality and quantity using well logging techniques? [10]
8. Construct the 2D depositional model of a meandering channel. Discuss the lithologic characters of meandering channel. [10]

[or]

Evaluate the formation processes, types and characteristic features of major sedimentary basins in India. [10]

SECTION C

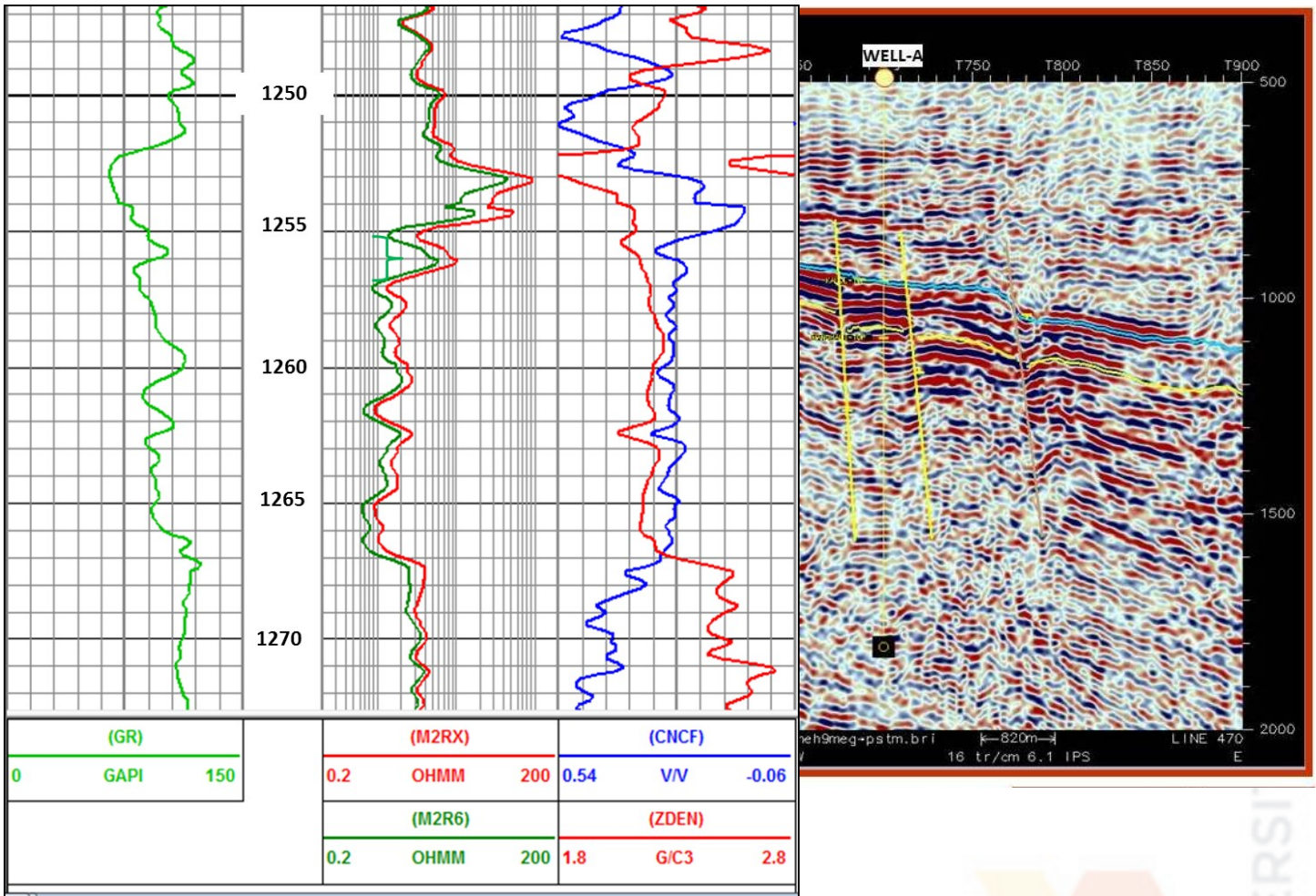
[2x20=40marks]

9. In a seismic section, paraconformity is marked by concordance
 - a) What do you mean by parasequence? Construct a depositional model to demarcate parasequence, system tract, sequence boundary, onlap, toplap, downlap and offlap. [2+8]
 - b) Elaborate different depositional settings in seismic reflection configuration by uniform pattern, divergent pattern, parallel to subparallel, chaotic and no reflection. [5]
 - c) Construct the depositional model/models to explain sea level transgression, regression and forced regression.[5]
10. “A geological model is a spatial representation of the distribution of sediments and rocks in the subsurface.” [10+10]
 - (a) How the seismic waves in rocks play role in petroleum exploration? Analyze the integrated seismic and well log methods in geological modelling.
 - (c) In a clean sandstone formation ρ_b is the measured bulk density 2.43 gms/cc, ϕ is porosity in fraction, ρ_f is fluid density in gm/cc and ρ_{ma} is matrix density for appropriate lithology. If we assume ρ_f to be equal to 1gm/cc for water, then by measuring bulk density of clean water bearing formations derive the porosity of the rock.

[or]

Refer the following well log profile and answer the following questions. [3+5+6+6]

- a) Demarcate the sandstone layers. b) Calculate the clay volume for depth zone of 1248-1250m. c) Find out the values of gamma, resistivity and density values for reservoir sands. d) Interpret the reservoir zones and assess the presence of hydrocarbon qualitatively. e) construct a structural model to represent the location of well A.



You can attach the interpreted log image (page no. 3) along with your answer copy

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Semester – V

Subject: applied geology

Max. Marks : 100

Code : EASC205

Duration : 3 Hrs.

No. of page/s: 3

(Draw correct diagram whenever necessary)

SECTION A (attempt all questions)

4x5=20

1. State the significance of microfossils and its utility in petroleum exploration.
2. Indicate whether the following statements are true or false (T / F)
 - a) One oil 'pool' can have different pressures in its different parts.
 - b) Higher °API gravity of crude corresponds to lower specific gravity
 - c) Preservation of organic matter is better in anoxic environment.
 - d) Humic coal has higher atomic H/C ratio than boghead coal.
 - e) The depths of gas windows are shallower than those of oil windows.
3. Define the role of fault in petroleum exploration.
4. Write a brief note on strati-structural reservoir trap mechanism.

SECTION B

4x10=40

5. Give an account of well log techniques in petroleum exploration.[10]
6. Discuss the importance of isopach and isochor maps in petroleum exploration.[10]
7. "A petroleum seep is a place where natural liquid or gaseous hydrocarbons escape to the earth's atmosphere and surface, normally under low pressure or flow. Seeps generally occur above either terrestrial or offshore petroleum accumulation structures"
 - a) What do you mean by hydrocarbon seepages?[3]
 - b) How will you identify and map them using remote sensing?[7]

8. In geology, depositional environment or sedimentary environment describes the combination of physical, chemical and biological processes associated with the deposition of a particular type of sediment in marine, continental and transition environment.
- a) Discuss hydrocarbon promising depositional environment in reference to sediment transporting processes and sediment characteristics. [5]
- b) In which environment you will get best source rock and reservoir quality? Justify your answer. [5]

Or

One of the most prolific periods for oil formation is the Cretaceous period, during which significant quantities of marine algae died and accumulated on the sea floor.

- i. Name the Indian petroliferous basin from this age.[2]
- ii. Discuss the petroleum system of the basin.[8]

SECTION C (question no. 9 is compulsory)

2x20=40

9. “The organic geochemistry of shales in terms of its organic richness, hydrocarbon source potential, thermal maturity, depositional environment, etc., are essential stipulations for hydrocarbon resources assessment.”
- (a) Discuss the characteristics of source rock and its assessing techniques?[10]
- (b) Analyze the relationship of time, temperature and source rock maturity.[5]
- (c) What are the factors that can change the normal maturity trend?[5]

Or

Refer the Rock Eval Pyrolysis data of **Well A** and answer the following questions:

Sample depth(m)	S1 mgHC/gRock	S2 mgHC/gRock	S3 mgCO ₂ /gRock	TOC wt%	Tmax (°C)
1630	0.30	12.5	0.8	13.70	434
1615	0.34	6.6	0.34	7.28	449
1570	0.22	6.3	0.41	6.93	467
1580	1.94	5.9	0.45	8.37	470

- a) Assess the source rock potential of the shales using Van Krevelan diagram. [10]
- b) Analyze the relationship of time, temperature, depth and source rock maturity. [2]
- c) What are the factors that can change the normal maturity trend with respect to depth? Explain based on the provided data set. [8]

9. (a) Explain the principle of Gamma Ray Log. (b) How the seismic waves in rocks play role in petroleum exploration? Analyze the integrated seismic and well log methods in geological modelling. (c) In a clean sandstone formation ρ_b is the measured bulk density 2.43 gms/cc, ϕ_e is porosity in fraction, ρ_f is fluid density in gm/cc and ρ_{ma} is matrix density for appropriate lithology. If we assume ρ_f to be equal to 1gm/cc for water, then by measuring bulk density of clean water bearing formations derive the porosity of the rock. [3+7+10]

