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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2021

Course: Geological and Geophysical Methods of Exploration **Semester: V**
Program: B.Tech. APE- UP **Duration: 03 hrs.**
Course Code: PEGS 3016 **Max. Marks: 100**

Instructions: All questions are compulsory in all the sections; however, internal choices are given in Q 8 (Section B) and Q 10 (Section C).

SECTION A

Each Question carries 4 Marks.

S. No.	Question	CO
Q 1	Explain the process to determine Strike and Dip of a geological feature in a Geological map.	**CO1**
Q 2	Refer the Table 1, which presents Rock Eval Pyrolysis data. Calculate the production index, hydrogen index and oxygen index for the studied samples.	**CO2**

Table 1

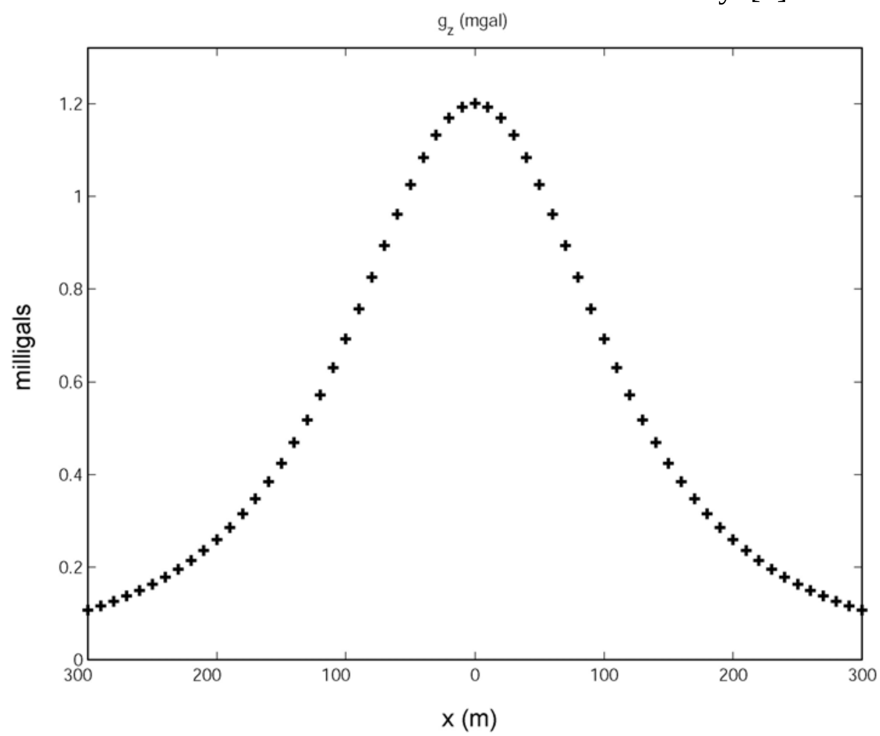
Sample No.	S1	S2	S3	TOC	Tmax
1	0.30	12.5	0.8	13.70	430
2	0.34	6.6	0.34	7.28	447
3	0.22	6.3	0.41	6.93	448
4	1.94	5.9	0.45	8.37	467

S. No.	Question	CO
Q 3	Explain the following: a) Changes observed in gravity anomaly response due to a spherical object with respect to change in density contrast, depth of the body from surface and size of the body. [3] b) Will a feather fall with the same acceleration as a brick or not and why (if both are in a vacuum)? [1]	**CO3**
Q 4	From well logs, the following P-wave velocities were determined: Sandstone 4.3 km/s, Water 1.5 km/s, Gas 0.3 km/s, Shale 2.4 km/s. Calculate the porosity of reservoir.	**CO5**
Q 5	Justify the statement, "Variation in grain size and geological structure can create directional permeability".	**CO4**

SECTION B

Each question carries 10 marks

S. No.	Question	CO
Q 6	Discuss Sequence of processes for Exploration of Hydrocarbons.	**CO1**

Q 7	Explain the procedure for source rock evaluation.	**CO2**
Q 8	i. Calculate the difference in theoretical value of "g" between latitudes 2.835 & 3.52 degrees. [5] ii. Calculate Bouguer Anomaly at latitude 4.4633 at an elevation of 434m above mean sea level if Raw gravity is 977929mgal and density of slab is 3.2g/cc. [5] **OR** A gravity survey was conducted over an area and **Figure 1** shows the gravity anomaly profile across the body. Assume the ore body to be spherical. a) Calculate the depth to the centre of the body. [3] b) Assume that gravity anomaly is due to the ore body of density 3800 kg m-3 and density of country rock is 2750 kg m-3. Calculate the radius of the ore body. [3] c) Calculate the excess mass and total mass of the ore body. [4]  **Figure 1**	**CO3**
Q 9	Discuss variation caused in amplitude of seismic waves under different circumstances.	**CO5**
SECTION-C **Each Question carries 20 Marks.**		
Q 10	A seismic data acquisition company carried out geophysical survey in a basin and observed following P-wave velocities in three different layers as 4.1km/s, 6.8km/s and 3.5km/s respectively. Consider the amplitude of incident wave as unity and density of all the layers as 2700kg/m3, depth to first and second interfaces are 600m and 1500m respectively and that	**CO5**

	there is no geometrical spreading, attenuation, or scattering. Construct the seismic record of amplitude versus time of the arrival of first three possible waves in the geophone. **OR** Construct a survey design for 3D seismic data acquisition on land.	
Q 11	Describe in detail about formation of petroleum w.r.t. geological processes, mention about all stages, genetic potential & transformation ratio, role of temperature, time and pressure.	**CO4**