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UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination – May 2018

Program/course: B.Tech. GSE, GIE & Mining Engg. **Semester – IV**
Subject: Exploration Geophysics **Max. Marks : 100**
Code : GSEG- 321 **Duration : 3 Hrs**
No. of pages: 02

	SECTION – A: Attempt All	**[Total Marks =20]**	**CO**
Q.1	What will be the porosity of the formation if the velocity of the 100% water saturated formation is 2500 m/sec and matrix velocity is 3000 m/sec? (Given: Velocity of P wave in water is 1450m/sec).	**(5)**	**CO5**
Q.2	A spherical cavity of radius 8 m has its centre 15 m below the surface. If the cavity is full of sediments of density 1.5×10^3 kg/m3 and is in a rock body of density 2.4×10^3 kg/m3. What is the maximum value of its gravity anomaly in mGal?	**(5)**	**CO2**
Q.3	In Wenner configuration a current of 50mA is passed through a current electrodes and a voltage of 10V is measured across the potential electrodes. What is the apparent resistivity if the spacing between the current electrodes is 90 m.	**(5)**	**CO3**
Q.4	In an electrical resistivity sounding survey a current of 30mA is passed through a current electrodes separated by a distance of 60 m and a voltage of 6V is measured across the potential electrodes separated by 20 m having same center as that of current electrode. i. Which type of the electrode configuration is used in the above survey? ii. What is apparent resistivity for the above electrode configuration? iii. Why the measured resistivity is known as apparent resistivity?	**(2)** **(2)** **(1)**	**CO3**
	SECTION – B: Attempt All	**[Total Marks 4×10= 40]**	
Q.5	**a.** Define acoustic impedance. What is the reflection coefficient at the interface separating sandstone (Vp = 2000 m/s; ρ = 1.5 gcm^{-3}) and shale (Vp = 2500 m/s; ρ = 2.0 gcm^{-3}). **b.** For the given interface in the above question, what percentage of the incident amplitude is reflected and transmitted? When the wave will pass from sandstone to shale it will bend towards the	**(10)**	**CO5**

	normal or away from the normal? (Illustrate with the help of a ray diagram)**.**		
Q.6	Consider a gas reservoir, which has 15% porosity. From well logs, the following P-wave velocities were determined: Sandstone 4.6 km/s, Water 1.8 km/s, Gas 0.5 km/s, Shale 2.5 km/s. What is the average P-wave velocity in the water-saturated reservoir? What is V_P in the gas-filled reservoir?	**(10)**	**CO5**
Q.7	Explain the changes in amplitude of seismic waves under different circumstances.	**(10)**	**CO5**
Q.8	What is Larmour Frequency? Briefly describe the working of Proton Precession Magnetometer.	**(10)**	**CO4**
	<u>SECTION – C:</u> Attempt All, internal choice is given in question 9.	**[Total Marks 40]**	
Q.9	Describe in detail about: a. Significance of survey design. b. Formation of database. c. Optimization of parameters. d. Types of spread.	 **(4)** **(6)** **(6)** **(4)**	**CO6**
OR	Describe in detail about: a. Earth's magnetism and its components. b. Types of seismic waves and their properties. c. What will be S-wave velocity of a medium having a Poisson's ratio and a P-wave velocity of 0.5 and 3 km/s respectively?	 **(8)** **(8)** **(4)**	
Q10.	An E&P company carried out seismic survey over an area. They observed variation in the velocity in three different layers as 3.1km/s, 4.5km/s and 6.8km/s respectively. Consider the amplitude of incident wave as unity and density of all the layers as 2700kg/m^3, depth of first and second interfaces are 400m and 1300m respectively and that there is no geometrical spreading, attenuation, or scattering. Construct the seismic record of amplitude versus time of the arrival of first three waves in the geophone.	**(20)**	**CO5**

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