



PRESIDENCY UNIVERSITY

BENGALURU

Roll No.														
----------	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Mid - Term Examinations – March 2026

Date: 14 -03-2026

Time: 09.30am to 11.00am

School: SOE	Program: B.Tech. (PET)		
Course Code: PET2113	Course Name: Fundamentals of Geophysical Logging Techniques		
Semester: IV	Max Marks: 50	Weightage: 25%	

CO - Levels	C01	C02	C03	C04	C05
Marks	14	14	22	-	-

Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Do not write anything on the question paper other than roll number.
- (iii) As informed, additional Charts will not be shared along with Question Paper. Therefore, use the Charts provided in the Question Paper to solve the problems and submit the Question Paper along with the Answer-script for Evaluation.**

Part A

Answer ALL the Questions. Each question carries 2marks.

5Q x 2M=10M

1	Select the correct answer: ____ of the following defines well logging most accurately. A. The process of drilling a well using geophysical tools B. The recording of subsurface formation properties using downhole instruments C. The measurement of drilling rate and mud properties D. The simulation of reservoir performance	2 Marks	L1	C01
2	Explain why operational decision-making is critical during tool failure or stuck tool incidents.	2 Marks	L2	C01
3	Identify the correct answer: ____ of the following defines porosity most accurately. A. Ratio of solid volume to bulk volume B. Ratio of pore volume to bulk volume C. Ratio of grain density to bulk density D. Ratio of permeability to porosity	2 Marks	L1	C02

4	Summarize Archie's equation.	2 Marks	L2	C02
5	Explain "Mud invasion".	2 Marks	L2	C03

Part B

Answer the Questions.

Total Marks 40M

6.	a.	During drilling of a highly deviated well, conventional wireline logging is not feasible. Apply your knowledge of basic log types to recommend an appropriate logging method and explain how the selected method ensures reliable formation evaluation.	5 Marks	L3	C01
	b.	A well exhibits abnormal log responses due to borehole enlargement and mud invasion. Demonstrate how a Well Log Analyst / Petrophysicist would apply log interpretation principles to correct the data and estimate porosity and water saturation.	5 Marks	L3	C01

Or

7.	a.	Predict the Depth (in ft) and BHT (in °F) at Point X using the Chart 01 shared at the end of this Question Paper.	5 Marks	L3	C01
	b.	Determine NaCl concentration at 26°C and resistivity at 76°C when the resistivity of a given water sample is 0.70 ohm-m at 26°C using the Chart 02 shared at the end of this Question Paper.	5 Marks	L3	C01

8.	a.	A reservoir interval exhibits lower resistivity than expected from its porosity. Apply the concept of shaliness to explain how clay minerals can alter resistivity response.	5 Marks	L3	C02
	b.	Two formations have the same shale volume but different shale distributions (laminated vs dispersed). Apply logging principles to explain how their resistivity responses will differ.	5 Marks	L3	C02

Or

9.	a.	Calculate Formation Resistivity Factor, when (a) $\emptyset = 6\%$, $m = 2.8$, $a = 1$ (b) $\emptyset = 10\%$, $m = 1.6$	5 Marks	L3	C02
	b.	Apply the Chart 03 shared at the end of this Question Paper to find Formation Resistivity Factor when (a) $\emptyset = 6\%$, $m = 1.8$, $a = 0.81$ (b) $\emptyset = 10\%$, $m = 2.2$	5 Marks	L3	C02

10.	a.	In a hostile well environment (high temperature and pressure), some logs show partial data loss. Illustrate the limitations imposed by hostile environments on downhole tools and how tool design mitigates these challenges.	10 Marks	L3	C03
	b.	A complex reservoir requires multiple petrophysical measurements in a single run. Examine the advantages and	10 Marks	L3	C03

	<p>limitations of tool combinations and tool string design in such situations.</p> <p style="text-align: center;">Or</p> <p>11. a. In the schematic diagram, gamma ray log and density log responses are presented along with the lithological variations. Illustrate the process of delineating sands and shales from the log responses.</p>			
	<p style="text-align: center;"> ← Decreasing radioactive counts Decreasing density → </p> <p style="text-align: center;"> Sand line Shale line High gicc Medium Low gicc </p> <p style="text-align: center;"> Sandstone Shale Limestone Shale Limestone Shale Sandstone Shale Coal </p> <p style="text-align: center;"> Gamma log Density log (BRD) </p>	10 Marks	L3	CO3
	<p>b. Under some circumstances, the FDC (Compensated Formation Density) log and Litho-Density log must be corrected for borehole size, and the SNP (Sidewall Neutron Porosity) log must be corrected for mudcake thickness. Utilize the given Chart 04 to modify the Formation Density, Litho-Density, and Mudcake thickness for a mud-filled borehole where borehole diameter (d_h), formation density (ρ_b), litho-density (ρ_L), mud density (ρ_m), SNP Apparent Porosity (ϕ_{SNP}), Caliper reading, and Bit Size are recorded as 13 in, 2.47 g/cm³, 2.36 g/cm³, 1.06 g/cm³, 14 p.u., 7^{5/8} in, and 7^{7/8} respectively.</p>	10 Marks	L3	CO3

Chart 01:

Temperature gradient conversions: $1^{\circ}\text{F}/100\text{ ft} = 1.823^{\circ}\text{C}/100\text{ m}$
 $1^{\circ}\text{C}/100\text{ m} = 0.5486^{\circ}\text{F}/100\text{ ft}$

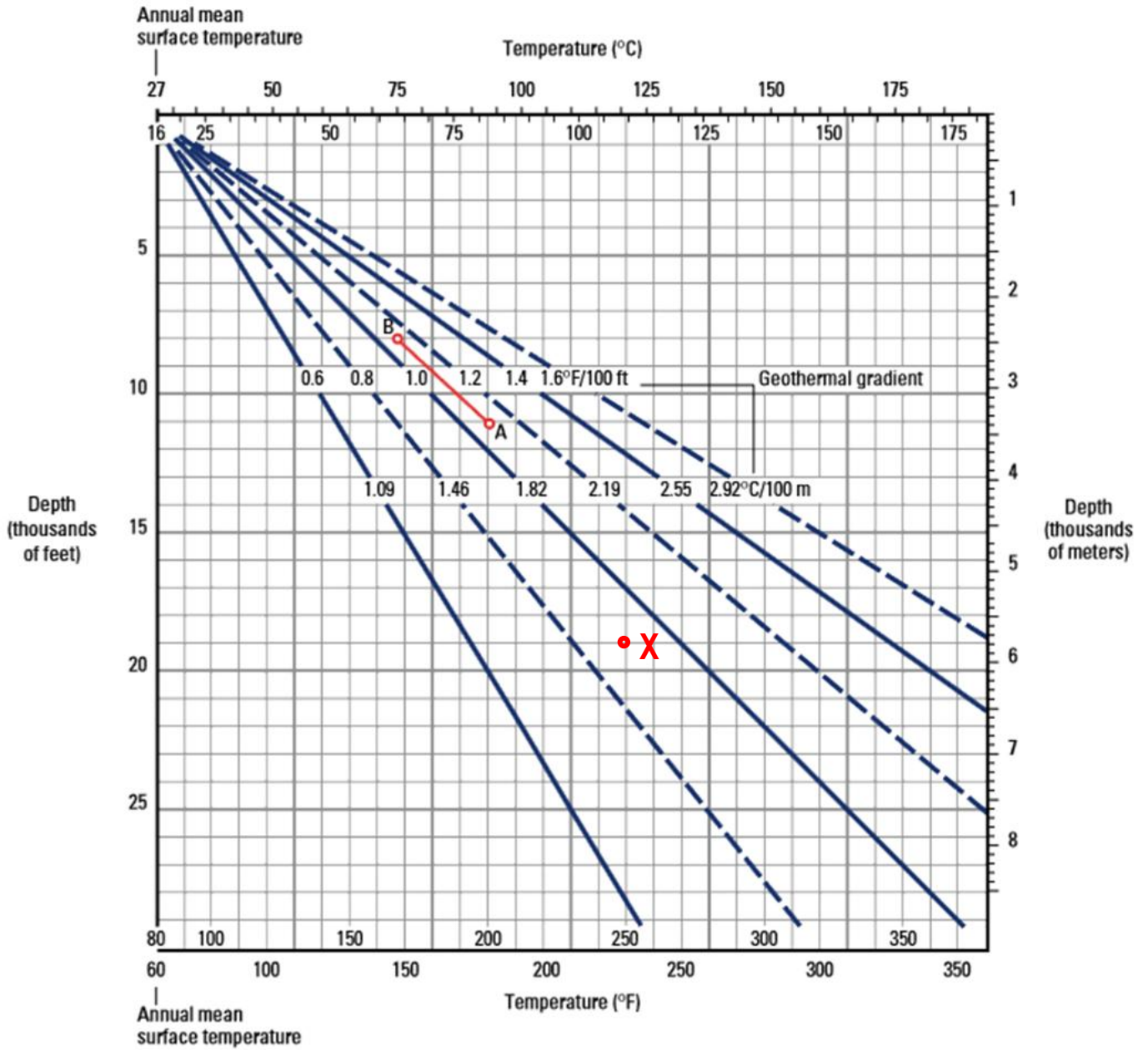


Chart 02:

Conversion approximated by $R_2 = R_1 [(T_1 + 6.77)/(T_2 + 6.77)]^{0.02}$ or $R_2 = R_1 [(T_1 + 21.5)/(T_2 + 21.5)]^{0.02}$

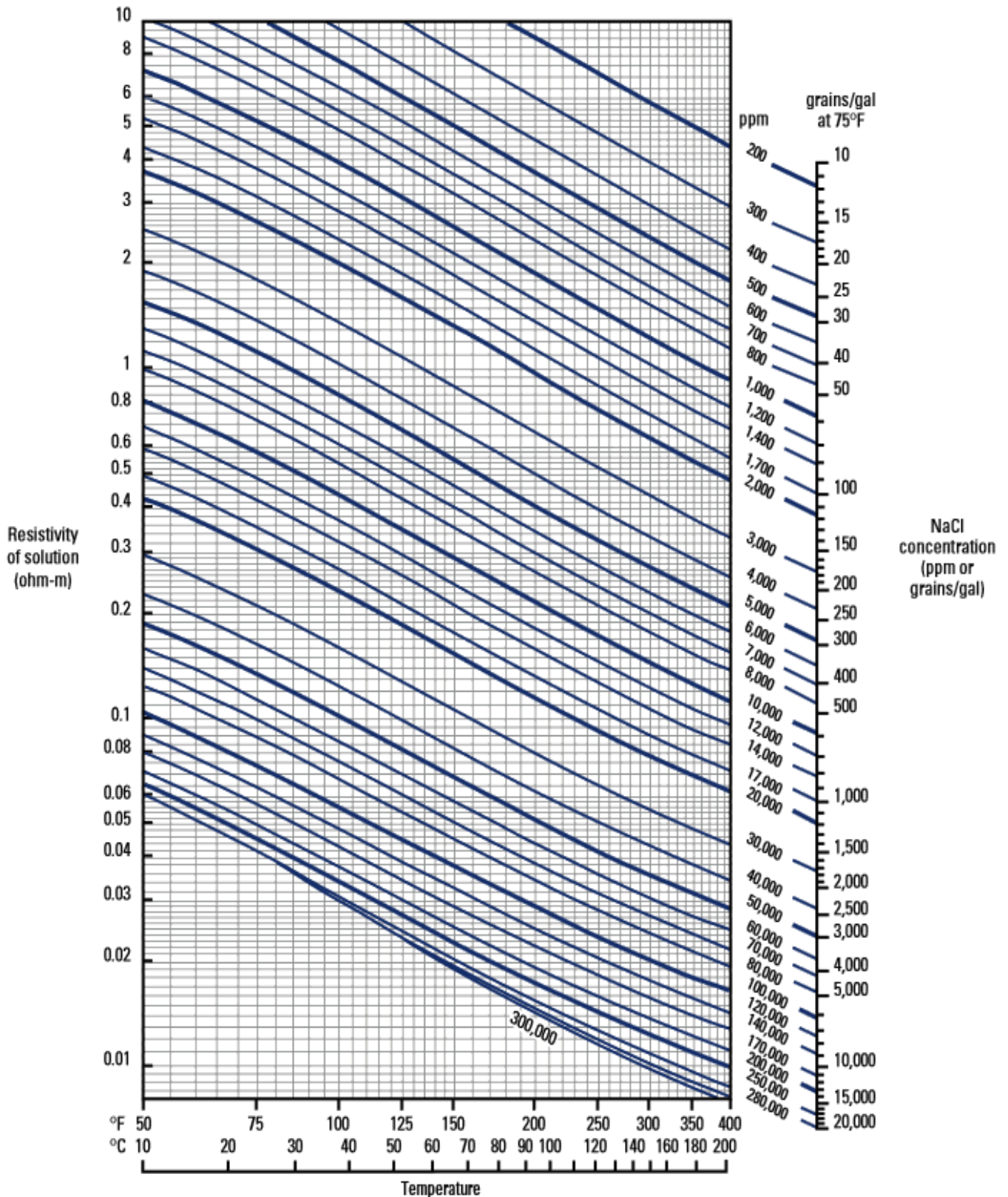


Chart 03:

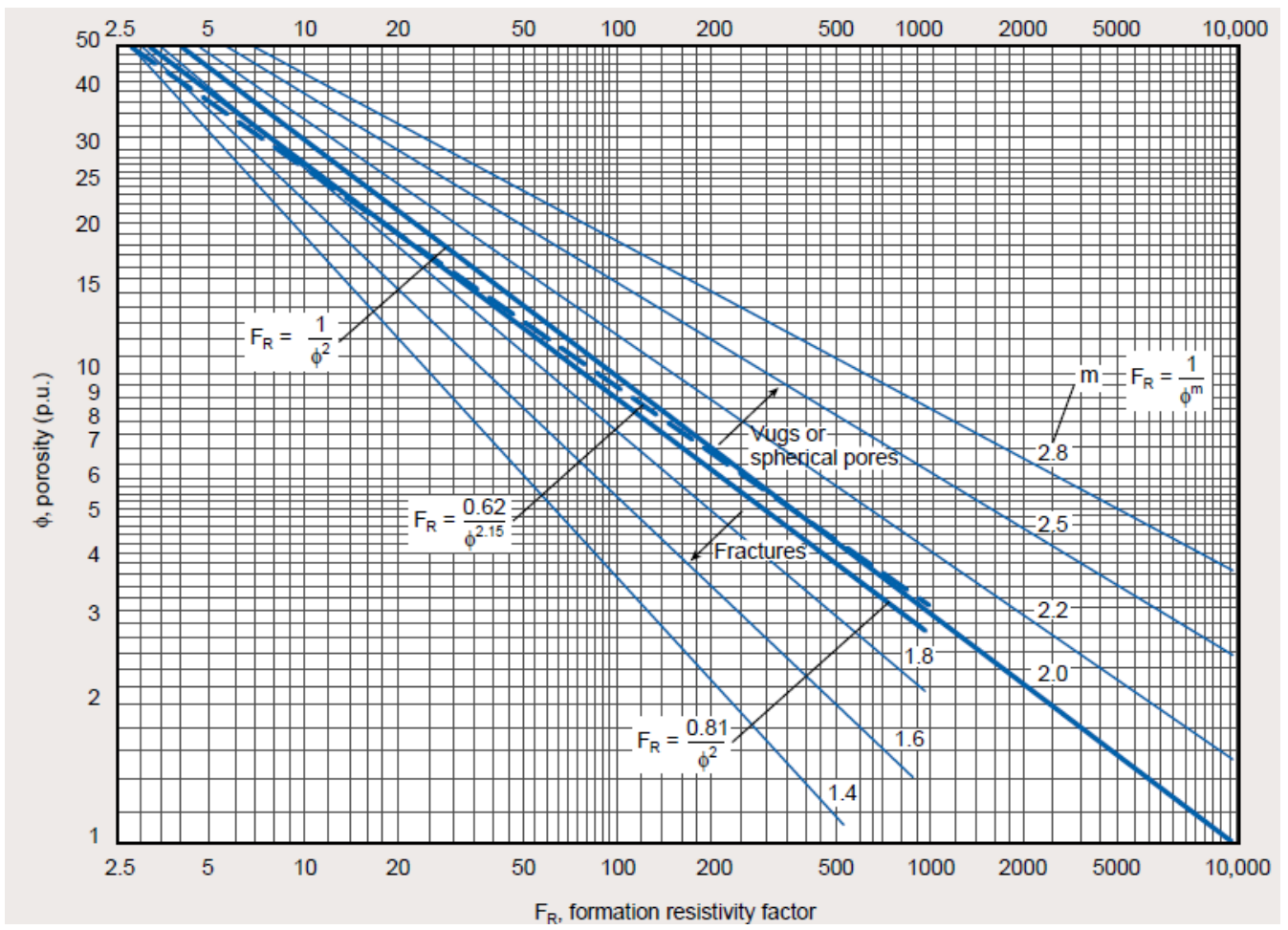


Chart 04:

