UNIVERSITI
TEKNOLOGI
PETRONAS

FINAL EXAMINATION
SEPTEMBER 2023 SEMESTER

COURSE	**:**	**QBM5053/QCM5053 – FORMATION EVALUATION & PETROPHYSICS**
DATE	**:**	**1 DECEMBER 2023 (FRIDAY)**
TIME	**:**	**9:00 AM – 12:00 PM (3 HOURS)**

INSTRUCTIONS TO CANDIDATES

1. Answer **ALL** questions in the Answer Booklet.
2. Begin **EACH** answer on a new page in the Answer Booklet.
3. Indicate clearly answers that are cancelled, if any.
4. Where applicable, show clearly steps taken in arriving at the solutions and indicate **ALL** assumptions, if any.
5. **DO NOT** open this Question Booklet until instructed.

Note :

i. There are **FIVE (5)** printed pages in this **double-sided** Question Booklet including the cover page .

1 a. Discuss the significance of density porosity and neutron porosity logging tool applications in total porosity estimation in oil and gas reservoirs.

[10 marks]

b Evaluate the application of Archie's model in clean sandstone and carbonate reservoirs in context of volumes of shales calculated using gamma ray and spontaneous potential logs.

[10 marks]

c. Justify petrophysical model used for a reservoir lithology and fluids characterization based on data used from logs interpreation

[5 marks]

2 a. Differentiate between Picket's and Hingle's plot application using an illustration for water saturation estimation in petroleum reservoir. List conditions /assumptions when applied.

[10 marks]

b. Analyze the response of p and s-waves, in a porous and non-porous reservoirs using wave propagation.

[10 marks]

c. Criticize the nuclear magnetic resonance (NMR) log strength for reservoirs fluids classification and pores size distribution.

[5 marks]

3 a. Explain the role of caliper log, drilling bit size and gamma ray log for qualitative and quantitative interpretation and identification of oil and gas reservoirs.

[10 marks]

b. Density and neutron log are used to mark the contact of fuids in depth column and fluids types in reservoirs. Discuss the significance of these two logs for identification of gas, oil and brine saturated zones.

[10 marks]

c. Compare spontaneous potential (SP) and gamma ray logs applications for identification of depositional environments of strata in a sedimentary basin.

[5 marks]

4 a Clays are hydrous aluminum silicates with negatively charged surface faciltating the extra conductivity for electric curent, causing a serious concern about the water saturation estimation in shaly sandstone. Analyze clays role in estimation of water saturation in shaly sandstone reservoirs.

[10 marks]

b Justify the significance of volumes of shales **(% Vsh)** in selection of saturation models.

[8 marks]

c Differentiate between neutron and nuclear magnetic resonance log concepts in evaluation of reservoirs fluids.

[7 marks]

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