



**Final Examination for Master Degree Students
(Advanced Hydrogeology)**

September, 2015	Code: (G 628)	100 Marks	Time: 3 hours
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Answer the following questions

- 1) State Darcy's law. Draw a picture of a Darcy tube, and label the variables used in Darcy's law. **(10 Marks).**
- 2) What is the difference between hydraulic conductivity and intrinsic permeability? **(5 Marks).**
- 3) A confined aquifer is contained between two impermeable bedrock valley walls. The valley walls are 9,840 ft apart (valley width), and the aquifer extends for more than 15 miles along the trace of the ancient drainage system. The aquifer is a sand and gravel interval that is 95 ft thick, and is completely confined by a continuous clay cap that averages 10 ft in thickness. The hydraulic conductivity of the clay cap is 0.0031 ft/d. The hydraulic conductivity of the aquifer averages 875 ft/d. Two observation wells are located 4550 ft apart along the direction of flow. The measured hydraulic head in the upgradient well is 1895.22 ft asl, and the hydraulic head in the downgradient well is 1842.14 ft asl. Calculate the water flux across the valley. **(10 Marks).**
- 4) What is the difference between integrated water resources management and sustainable water resources management?. **(12 Marks).**
- 5) When it has been determined that a numerical model is necessary and the purpose of the modeling effort has been clearly defined, the task of model design and application begins. On the light of this sentence discuss the steps of the modeling protocol. **(18 Marks).**
- 6) Mathematical models consist of governing equations, boundary conditions and initial conditions. Discuss the different types of boundary conditions. **(22.5 Marks).**

- 7) Each of the following is the flow equation describing 2D/3D Transient/Steady flow in a saturated/unsaturated homogeneous/heterogeneous isotropic/anisotropic medium. Please carefully look at each equation and write down five words separated by commas to describe if the flow is 2D/3D transient/ steady in saturated/ unsaturated homogeneous /heterogeneous isotropic/anisotropic medium? (22.5 Marks).

A)-
$$\frac{\partial}{\partial x} \left(K_x \frac{\partial h}{\partial x} \right) + \frac{\partial}{\partial y} \left(K_y \frac{\partial h}{\partial y} \right) + \frac{\partial}{\partial z} \left(K_z \frac{\partial h}{\partial z} \right) = S_s \frac{\partial h}{\partial t}$$

..... , , , ,

B)-
$$\frac{\partial}{\partial x} \left(K \frac{\partial h}{\partial x} \right) + \frac{\partial}{\partial y} \left(K \frac{\partial h}{\partial y} \right) + \frac{\partial}{\partial z} \left(K \frac{\partial h}{\partial z} \right) = S_s \frac{\partial h}{\partial t}$$

..... , , , ,

C)-
$$K_x \frac{\partial^2 h}{\partial x^2} + K_y \frac{\partial^2 h}{\partial y^2} + K_z \frac{\partial^2 h}{\partial z^2} = S_s \frac{\partial h}{\partial t}$$

..... , , , ,

D)-
$$\frac{\partial^2 h}{\partial x^2} + \frac{\partial^2 h}{\partial y^2} + \frac{\partial^2 h}{\partial z^2} = \frac{S_s}{K} \frac{\partial h}{\partial t}$$

..... , , , ,

E)-
$$\frac{\partial^2 h}{\partial x^2} + \frac{\partial^2 h}{\partial y^2} + \frac{\partial^2 h}{\partial z^2} = 0$$

..... , , , ,

F)-
$$\frac{\partial}{\partial x} \left(K_x(\psi) \frac{\partial \psi}{\partial x} \right) + \frac{\partial}{\partial y} \left(K_y(\psi) \frac{\partial \psi}{\partial y} \right) + \frac{\partial}{\partial z} \left[K_z(\psi) \left(1 + \frac{\partial \psi}{\partial z} \right) \right] = C(\psi) \frac{\partial \psi}{\partial t}$$

..... , , , ,

G)-
$$\frac{\partial^2 h}{\partial x^2} + \frac{\partial^2 h}{\partial y^2} = 0$$

..... ,

H)-
$$\frac{\partial}{\partial x} \left(K_x b \frac{\partial h}{\partial x} \right) + \frac{\partial}{\partial y} \left(K_y b \frac{\partial h}{\partial y} \right) + q_s(x, y, t) = S_y \frac{\partial h}{\partial t}$$

..... ,

I)-
$$\frac{\partial}{\partial x} \left(K_x b \frac{\partial h}{\partial x} \right) + \frac{\partial}{\partial y} \left(K_y b \frac{\partial h}{\partial y} \right) + q_s(x, y, t) = S_y \frac{\partial h}{\partial t}$$

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Prof. Dr. Abdel Azim Ebraheem

Dr. Ahmed Sefelnasr

Best Wishes



Post Graduate Examination
Ore Genesis : Course No. G. 617

Answer only Four Questions from the Following

Question No. I

A- In a short article summarize the principal theories for ore forming processes.

B- What are the main steps you should follow for establishment of a mine operation project? What are the main factors you must take in your consideration for evaluating the potentiality of an ore body? What are the different factors involved in localization and/or precipitation of an ore deposits? (25 Marks)

Question No. II

A- How can you genetically classify the different gold occurrences of Egypt to be in harmony with the evolutionary model trend of the Egyptian terrain? Why gold is almost found concentrated along shear and fracture zones at the immediate vicinity with the host rock?

B- Discuss briefly the dominant characteristics genetic aspect for both the Epithermal gold – silver (copper) mineralization and the Mesothermal – Orogenic (Lode-gold) mineralization styles. How gold precipitation mechanism goes in the above two different environmental styles? Mention only four important Egyptian mines and give their average gold content (grade, g/t) (25 Marks)

Question No. III

A- What are the different sources of water circulated under the Earth Crust? and What type of ores that could result from such different sources of water? What types of wall rock alterations which could be used as practical guides for hydrothermal deposits? 13

B- Evaporates are formed from different types of water, What are these types? What are the requirements formation of salt deposits? What are the normal paragenetic sequences of an evaporate assemblage from a sea water brine? From Where the Egyptian natural evaporates wealth resource comes? (25 Marks)

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Question No.IV

A- What is the recent idea for the origin of the pegmatites? How can you explain zoning in pegmatites? What are the economic potential mineral wealth resources of the Egyptian granites G1, G2, and G3 and the famous Egyptian pegmatites ?

B- What are the common characteristic features of porphyry copper mineralization? What is your explanation for the rarity or absence of copper porphyry deposits in Egypt? Where are the most suggestive sites of exploration for this ore in Egypt? (25Marks) ✓

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Question No V

A- What factors controlling and limiting the development of oxidation zone? What types of ores you look fore in the oxidation zone? Elucidate your answer with chemical equations.

B- In Egypt, there are some important economic ore deposits which are genetically resulted from metamorphic processes, what are these deposits? Where these deposits do occur? Discuss briefly its common uses.

(25Marks)

بالتوفيق

Good Luck

Examiner: Prof. Dr. Nadia Sharara

نadia Sharara



Subject: Gravity Methods (G636)

Student: Post graduate students

100 Marks

Answer the following questions

1- Fill the blanks. (Illustrate you answer) (35 marks)

1- Positive gravity anomalies are generally denoting to the following geologic features:- (7 marks)

- a-
- b-
- c-

2- Negative gravity anomalies are generally denoting to the following geologic features:- (7 marks)

- a-
- b-
- c-

3- Linear gravity anomalies are generally denoting to the following geologic features:- (7 marks)

- a-
- b-
- c-

4- All the gravimeters change null reading with time when set up on the same station, due to:- (7 marks)

- a-
- b-
- c-

5- The most important geologic parameter is the density contrast:
Density contrast = Density of the target – Ambient density: Mentioned three examples verifying this concept:- (7 marks)

- a-
- b-
- c-

II- Choose the correct answer and comment on your choice with illustration. (35 Marks)

1- Free air correction of gravity data is considering the following parameter: (5 marks)

- a- Elevation of every gravity station
- b- Attraction of materials between the stations and the datum plane

c- Rotation of the earth and its slight equatorial bulge

2- Bouguer correction of gravity data is considering the following parameter:-

(7 marks)

a- Elevation of every gravity station

b- Attraction of materials between the stations and the datum plane

c- Surface irregularity in the vicinity of the station

3- Upward continuation of gravity measurements is generally carried out for deducing structures of:

(7 marks)

a- Local extensions

b- Regional extensions

c- Shallow occurrence

4- Downward continuation of gravity measurements is generally carried out for deducing structures of:

(7 marks)

a- Local extensions

b- Regional extensions

c- Shallow occurrence

5- In FFT (Fast Fourier Transform), frequency and wavelength of the transformed gravity anomalies are function in:

(7 marks)

a- Depth to the corresponding causative bodies

b- Density of the corresponding causative bodies

c- Geometry of the corresponding causative bodies

III- Write about the following:-

(30 marks)

1- Kom Umbo basin is one of large basin which has hydrocarbon occurrences.

Discuss how you can apply gravity data processing in outlying geologic and tectonic sitting of this basin.

(10 marks)

2- Applications of gravity methods in engineering and groundwater exploration.

(10 marks)

3- Tracing of salt dome and its encountered structures from gravity data processing and interpretation.

(10 marks)

===== with my best wishes =====

Prof. Dr. M. Senosy



Answer ONLY FOUR of the following questions:

Question no. 1: (25 Marks)

- Determinating relative ages of rocks and defining their stage boundaries is an important paleontologic issue that is necessary for geologic interpretation and evaluation of the geological history of sedimentary basins, discuss this statement and state the role of organic-walled microfossils in this context.

Question no. 2: (25 Marks; 5 Marks each)

Write briefly on:

- A- Taxonomic criteria of pollen grains.
- B- Biostratigraphic importance of spores.
- C- Advantages of dinoflagellate cysts in biostratigraphy.
- D- Different kinds of fossil palynomorphs.
- E- Stratigraphic ranges of the most important representatives of terrestrial land plants.

Question no. 3: (25 Marks)

A- Affirm if the following statements are correct or wrong: (15 Marks; 1.5 marks each)

- 1- Chitinozoa are considered palynomorphs.
- 2- Pollen and spores share similar ornaments.
- 3- Environmental variables control distribution of phytoplankton in sea bottom sediments.
- 4- Resin are preserved in sediments but is not part of the palynofacies.
- 5- All pollen grains are always seen in polar views because they are of spherical outlines.
- 6- Spores appeared in the Cretaceous Period.
- 7- Pollen grains are smaller in size and are therefore are easily transported by winds than spores.
- 8- Transport of pollen and spores by wind or water does not affect their diversity.
- 9- Terrestrial palynomorphs are preserved only in terrestrial environments; they can also be transported and deposited in, for example, lake bottom sediments or bottom marine sediments.
- 10- palynomorphs are best preserved in alkaline environments.

B- Working in palynology labs is always risky, discuss this statement and refer to safety precautions. (10 Marks)

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____ See next page ____

Question no. 4: (25 Marks; 12.5 Marks each)

- Write an article on:

A- Standard palynological processing techniques.

B- Biology of spores and pollen grains.

Question no. 5: (25 Marks)

- Write a comprehensive article on the advantages, disadvantages and limitations of paleopalynology.

أنتهت الأسئلة

Examiners: Prof. Magdy S. Mahmoud, Dr. Amr S. Deaf

Good Luck

Postgraduate Examination

✓ "Stratigraphy"

September 2015

G 603

100 marks

Time: 3 hours

Answer three questions only:-

The First question:-

- What are the main factors controlling the marine environment?
- Give some examples for the Biostratigraphic correlation.

Second question:-

- What are the main Paleozoic and Mesozoic index fossils and their evolutionary relation?
- What are the rocks forming Fossils (give some example in Egypt)?

Third question:-

- Write a report on the lower Paleozoic type localities of geologic sections in Europe (Lithostratigraphy and biostratigraphy).

Fourth question:-

- Compare between the different types of biozoines (give examples in Mesozoic of Egypt).
- What do you know about the Jurassic type section?

PART-I

Answer **TWO ONLY** of the following questions:

- 1- Discuss in some details the different methods of measuring, graphic representation and applications of grain size of clastic sediments. (25 Degree)
- 2 - Write a brief notes on the primary sedimentary structures. (25 Degree)
- 3- Discuss briefly
 - (a)- Surface textures of sedimentary aggregates. (12.5 Degree)
 - (b)- The differences between roundness and sphericity. (12.5 Degree)

PART-II

1. Answer the following question

The three groups of clastic rocks are:-

- a.....
- b.....
- c.....

10 degrees

Answer **four questions** from the following

2- a. What is breccia?

b. What is conglomerate?

10 degrees

3- a. What is sandstone?

b. Mention the major minerals in a sandstone rock?

10 degrees

4. a. What is quartz arenites?

b. What is lithic arenites?

10 degrees

5. a. What is diagenesis?

b. Mention briefly the diagenetic stages and regimes?

10 degrees

6. Write a brief account on the composition of the mudstone and shale.

10 degrees

Prof. Dr. Mohamed A. Soliman



Prof. Dr. Ahmed-Reda M. ElYounsy



Geology Department Faculty of Science Assiut University		Time: Two hours September 2015
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M. Sc. Final Examination
Subject: Field Geology (335G)
Students: M. Sc. Geology students

Field Geology (100 marks)

Answer only **four questions** out of the following

1. Write briefly on the following items (25 marks):

- a. Description of rock units (12.5 marks).
- b. Unconformities (12.5 marks).

2. Write short notes on the following terms (25 marks):

- a. Collecting rock samples (12.5 marks).
- b. Mechanism of folding (12.5 marks).

3. Describe the following terms (25 marks):

- a. Texture of sedimentary rocks (12.5 marks).
- b. Presenting stratigraphic section (12.5 marks).

4. Write briefly on the following items (25 marks):

- a. Beds and bedding (12.5 marks).
- b. Structure indicating stratigraphic tops (12.5 marks).

5. Describe the following terms (25 marks):

- a. Post depositional sedimentary structures (12.5 marks).
- b. Textures of metamorphic rocks (12.5 marks).

Good luck

Dr. Abdalla El Ayyat



إمتحان تمهيدى ماجستير جيولوجيا

الزمن: ثلاث ساعات 100 Marks	المادة: الصفات الطبيعية للصخور (630 G)	12 سبتمبر 2015
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Answer FIVE Questions Only from the following: (20 Marks for each)

- 1- Write on the porosity and permeability in the clastic rocks in view of identification, types and factors controlling them.
- 2- Write briefly on the following and discuss briefly the factors affecting them: roundness, sphericity, form and surface texture.
- 3- Identify the rock joints and write on the physical attributes of rock joints.
- 4- Identify each of the following rock properties and mention the factors affecting them: density, hardness, stress, strain and strength.
- 5- Discuss an experiment for determination of specific gravity.
- 6- Discuss an experiment for determination of organic matter.

Prof. Dr. Essmat A. Keheila

Dr. Mahmoud A. Essa



كلية العلوم-قسم الجيولوجيا



جامعة أسيوط

امتحان طلاب تمهيدى ماجستير

مقرر (٦٠٢ ج) جيولوجيا تصويرية استشعار عن بعد

الزمن : ٣ ساعات

الدرجة الكلية (١٠٠ درجة)

سبتمبر ٢٠١٥

Illustrate your answers with suitable drawings when possible

I. GIVE SHORT NOTES ON FIVE OF THE FOLLOWING:

(25 marks)

- a) Remote sensing systems. (5 marks)
- b) Sun Synchronous satellite orbits. (5 marks)
- c) Atmospheric windows. (5 marks)
- d) Spectral resolution and ground resolution. (5 marks)
- e) Interaction processes between Electromagnetic Energy and matter. (5marks)
- f) Framing and scanning remote sensing systems. (5marks)

II. ANSWER ONLY THREE OF THE FOLLOWING QUESTIONS:

(25 marks each)

1. Compare and contrast between the images acquired by the three generations of LANDSAT satellites.
2. Discuss the most important characteristics of SPOT satellite imaging system.
3. Write briefly on the structural photo-interpretation.
4. Give a brief note on both Thermal imagery and Radar imagery.

GOOD LUCK!

Prof. Dr. Moustafa M. Youssef

Postgraduate Examination

"Special Course"

September 2015

G 645

100 marks

Time: 3 hours

Answer three questions only:-

The First question:-

- What are the Mass Extinction Major events in the geologic history?
- Compare between different types of Mass Extinctions.

Second question:-

- Discuss the causes of Ordovician - Silurian Extinction bioevents.
- Discuss Devonian - Carboniferous extinction event and the causes of the event.

Third question:-

- Write on the Permian – Triassic – Jurassic Extinction bioevents and the causes of these events.

Fourth question:-

- What are the major Extinction bioevents during the Cretaceous and at K/T boundary and the causes of the bioevents (in your opinion)



امتحان درجة الماجستير (جيولوجيا) سبتمبر ٢٠١٥

الزمن:	الدرجة:	مقرر اختياري (٦٤٦ ج)
ثلاث ساعات	١٠٠	

Answer the following questions:

1. Discuss briefly only TWO of the following: (33Mark)
 - a. Intrusion of saline water in groundwater aquifers.
 - b. Subsurface investigations of groundwater.
 - c. Stream flow and groundwater levels.
2. Give an account on only TWO of the following: (33Mark)
 - a. Base flow recession curve.
 - b. Test pumping operations.
 - c. Geophysical logging.
3. Write short notes on the drilling of the groundwater wells. (34Mark)

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Good Luck

Prof. El sayed Abu El Ella

بسم الله الرحمن الرحيم

جامعة أسيوط
كلية العلوم – قسم الجيولوجيا

امتحان الدراسات العليا (الماجستير)

الزمن : ثلاث ساعات

مقرر: ميكانيكا الصخور (٦٢٥ ج)

دور سبتمبر ٢٠١٥

Answer the following questions:

- 1- Discuss in details the factors affecting the mechanical properties of bodies which in turn affected its deformability. (25 Degree)
- 2- How is “brittle” deformation different from “ductile” deformation, and why? (25 Degree)
- 3- As the rock is gradually loaded, it passes through several stages. Discuss the different stages of Stress-Strain Behaviour. (25 Degree)
- 4- The stress-strain relation of rock deformation for a uni-axial loading test. (25 Degree)

----- GOOD LUCK -----

Prof. Dr . Ahmed Reda M. El Younsy



**Final Exam for MSc Students
September 2015**

Geochemistry of Sediments (G 611)

Time allowed: 3 hours

Answer only four (4) from the following: (25 marks for each)

1-Write on:

A- Precipitation of early carbonate cements in shallow water environment.

B- Dissolution of continental shelves carbonates

2- Discuss the diagenetic sequence and redox environments in early diagenesis.

3- Using geochemical multiproxy approach (elements and elemental ratios)

Explain how you can evaluate the possible causes responsible for the following geologic events:

Detrital input - Productivity input - Hydrothermal and volcanic inputs.

4- Explain how you can assess paleoredox conditions using the redox-sensitive trace metals and/or their ratios?

5- Benthic foraminifera play a significant role in global bio-geochemical cycles of inorganic and organic compounds, making them one of the most important animal groups on earth. Therefore, benthic foraminifera can be used as bio-indicators of environmental pollution by industrial waste, mainly trace elements, as well as by agricultural and domestic effluent.

Explain the methods used on the benthic foraminifera to prove this, explaining your answer by a case study?

6- Discuss briefly:

A- How you can deduce the source rock composition **in shale sediments** using the major elements geochemistry?

B- The dissolution of geological samples for chemical analysis.



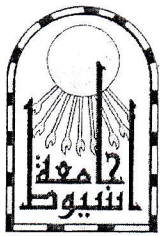
Answer the required questions only, supporting your answer with suitable sketches !

Write shortly on the use of suitable well logging methods in **ONLY FOUR** of the following applications: (25 Marks for each)

- 1) Reservoir rock characteristics determination (*porosity, permeability, shale volume, water saturation, hydrocarbon saturation and overpressure*).
- 2) Lithology identification.
- 3) Hydrocarbon source rocks evaluation.
- 4) Facies and sedimentological analysis.
- 5) Structural and stratigraphic investigations.

Best wishes !!

Prof. Dr. Awad A.A. Omran



Assiut University
Faculty of Science
Geology Department

M.Sc. Mineralogy Examination (610 G), September, 2015

Time Allowed : 3 Hours

Answer Three Questions Of The Following:

1. Write on Olivine group.
2. Compare between Pyroxene and Amphibole groups.
3. Give an account on Feldspar group.
4. Write on Silica group.
5. Write on Mica group.

Good Luck



امتحان دراسات عليا (ماجستير)
طباقية سيزمية وتتابعية (٦٤١ ج)

Time allowed: Three Hours

7 Sep. 2015

Answer **THREE ONLY** of the following questions: (100 degrees)

1. Write briefly on **ONE ONLY** of the following: (33.5 degrees)
 - a. Recognition of the stratigraphic surfaces and system tracts on seismic data.
 - b. Recognition of log trends, key surfaces and system tracts in wireline logs.
2. Describe the sequence stratigraphic models for ramps, rimmed shelves and isolated platforms in carbonate systems. (33.5 degrees)
3. Write briefly on the recognition of sequence boundaries, lowstand system tracts, transgressive system tracts and highstand system tracts in alluvial strata. (33.5 degrees)
4. Give a brief account on **ONE ONLY** of the following: (33.5 degrees)
 - a. Sequence boundaries, surfaces and incisions in paralic succession.
 - b. Paralic system at a seismic scale and within a sea-level cycle.

Best Wishes

Prof. Dr. Emad Ramzy Philobbos



MSc. Final Examination
Subject: Non-Clastic Sedimentary Rocks (605G)
Students: M. Sc. students of Geology
Time allowed: 3 Hours

Answer only Five Questions out of the following:

1. Describe the main diagenetic processes in carbonate rocks and their effects on the amount and type of porosity.
2. Write in detail on the diverse depositional environments of coal formation.
3. What are the oolitic iron ores, describe their environments of formation.
4. Describe in detail the mode of phosphate formation and the factors controlling the formation of phosphate.
5. Write short notes on the classic "evaporating dish" mechanism for evaporite genesis.
6. What are the different types of chert, describe their origins.

Good luck

Prof. Dr. Esmat A. Keheila
Dr. Abdalla M. El Ayyat

Geology Department Faculty of Sciences Assiut University MSc. Exam.		Ore Microscopy (616G) October , 2015 Three Hours
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Answer **FIVE ONLY** of the following:

- 1 A) What are the procedures for measuring the reflectivity ?
B) What are the sequence procedures of Vickers hardness measurements?

- 2.A) Write in short about the application of reflectivity on the compositional characterization of minerals.
B) Discuss briefly the primary texture of open-space deposition.

- 3.A) Discuss briefly the features controlling the development of replacement textures.
B) Mention the principals which could be applied for carrying out the paragenetic sequences of minerals.

- 4.A) Write in short about the secondary textures resulting from cooling
B) Discuss shortly the factors controlling microindentation hardness values of minerals.

- 5.A) Write in short about the secondary texture resulting from deformation.
B) Discuss briefly the errors in reflectivity measurements, and their corrections.

- 6.A) Write in short about the paragenetic sequences of the North Pennines -England lead-zinc ores deposits.
B) What are the criteria of primary and secondary Fluid Inclusions.

Best Wishes

بسم الله الرحمن الرحيم

ASSIUT UNIVERSITY
FACULTY OF SCIENCE
GEOLOGY DEPARTMENT

جامعة أسيوط
كلية العلوم
قسم الجيولوجيا

الدرجة: 100 درجة

دور سبتمبر 2015 امتحان الدراسات العليا

الزمن : 3 ساعات

مقرر 645 جيولوجيا (مقرر خاص)

Special Course

Write on FIVE of the following subjects:

- 1- The definition and classification of the coast.
- 2- Geomorphology of coastal sand (beach).
- 3- The shelf sediments.
- 4- The distribution of sediments and sedimentary structures in the coastal lagoons.
- 5- The types of bedding in tidal flats sediments.
- 6- The bioturbation and fauna in tidal flats.

Good Luck

Prof. Dr. Nageh Obaidalla

بسم الله الرحمن الرحيم

ASSIUT UNIVERSITY
FACULTY OF SCIENCE
GEOLOGY DEPARTMENT

جامعة أسيوط
كلية العلوم
قسم الجيولوجيا

الدرجة: 100 درجة

دور سبتمبر 2015 إمتحان الدراسات العليا

الزمن : 3 ساعات

مقرر 623 جيولوجيا (طبقات مصرية)

STRATIGRAPHY OF EGYPT

Write on FIVE of the following subjects:

- 1- The Definition and Prerequisites of the Global Stratotype Section and Point (GSSP)
- 2- The litho-, Bio- and chemostratigraphy as well as the paleoecology of the Paleocene-Eocene boundary interval in its Global Stratotype Section and Point at Dababiya, South Luxor, Egypt.
- 3- The global events characterizing the Paleocene-Eocene boundary interval.
- 4- The Miocene rock units at the Gulf of Suez (show your answer in a table).
- 5- The geographic distribution of the Aptian-Albian sediments in Egypt.
- 6- The difference in the Cenomanian sediments at Sinai and Bahariya Oasis.

Good Luck

Prof. Dr. Khaled Ouda, Prod Dr. Nageh Obaidalla



Postgraduate Examination (M.Sc.)

Time: 3 Hrs	Total marks: 100	Advanced Petroleum Geology (629G)	September 2015
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Answer only FIVE questions of the following: (20 marks for each)

1. a) What is meant by a reservoir rock? Explain briefly the main different types of these reservoirs.
b) What are the main evidences supporting petroleum migration and those opposing it?
2. Write short notes on:
 - a. Evidences supporting the organic origin of petroleum.
 - b. Theories of oil movement.
 - c. Syngentic oil and postlithification oil.
 - e. Main characteristics of oil reservoir.
3. a) Explain briefly the favorite environment of petroleum formation.
b) Write short notes on the different types of structural traps.
4. Give the differences between:
 - a. Primary and secondary migration.
 - b. Source bed and source material.
 - c. Effective porosity and total porosity.
 - d. Vertical and lateral movement of oil.
5. Exploration techniques start with methods that involve the obvious: **Look for oil at the ground surface**. Explain briefly the different direct and indirect (geophysical) methods used for petroleum explorations.
6. Write an article on the natural gases and its potentiality in Egypt.

الممتحن : ا.د / حمزة احمد إبراهيم

Assiut University
Faculty of Science
Geology department
Total marks : 50

Post graduate students exam. In Hydrogeochemistry (G632)

September 2015

Time : 3H

Answer the Following questions :

1) Write on only two of the following topics :

- a) Adsorption and ion exchange processes.
- b) Radiocarbon dating of groundwater.
- c) Diffusion and mechanical dispersion.

2) How to present a chemical analysis results.

3) What are the sources of the groundwater contamination.

GOOD LUCK

Prof. Dr. Abdelhay Aly Farrag



كلية العلوم-قسم الجيولوجيا



امتحان طلاب تمهيدى ماجستير

مقرر (٦١٨ ج) جيولوجيا تركيبية

الزمن : ٣ ساعات

الدرجة الكلية (١٠٠ درجة)

سبتمبر ٢٠١٥

ANSWER THE FOLLOWING TWO QUESTIONS

Illustrate your answers with suitable drawings

1. Write on the general characteristics, the tectonic history and economic importance of the fold system deforming areas in northern Egypt. (20 marks)
2. Mention the main structural features associating the formation of the major strike-slip faulting. (20 marks)

ANSWER ONLY THREE OF THE FOLLOWING QUESTIONS:

- 3- Summarize briefly the different causes leading to rift formation. (20 marks)
- 4- Compare and contrast between tectonic evolution of the Gulf of Suez and Gulf of Aqaba . (20 marks)
- 5- Discuss briefly the fault systems affecting the Egyptian territory giving examples from areas affected by the major of these faults . (20 marks)
- 6- Compare and contrast between the transfer and transcurrent faults. (20 marks)

GOOD LUCK !

Prof.Dr. Moustafa M. Youssef

Prof.Dr. Ali A. Khudeir

بسم الله الرحمن الرحيم

جامعة أسيوط
كلية العلوم - قسم الجيولوجيا

امتحان الدراسات العليا بكلية العلوم (جيولوجيا)

المادة: الحفريات الدقيقة (G620)
(G620) (Micropaleontology)

الزمن: ثلاث ساعات

الدرجة: 100 درجة

سبتمبر 2015م

أجب عن الأسئلة الآتية:

السؤال الأول: (20 درجة)

Discuss the applications of foraminifera in the determination of paleodepths and paleoclimates.

السؤال الثاني: (20 درجة)

Compare between the benthonic foraminifera and nannoplankton in: systematic position - environmental habitat - shell walls - mode of life.

السؤال الثالث: (20 درجة)

Summarize the morphologic groups of nannoplankton

السؤال الرابع: (20 درجة)

Write a short essay on one only of the following:

- 1- The evolution of foraminifera.
- 2- Formation the coccoliths.

السؤال الخامس: (20 درجة)

In a table explain the geologic history of planktonic foraminifera and nannoplankton.

تمت الأسئلة مع التمنيات بالتوفيق

د. نصر احمد عبدالمقصود

ا.د. ناجح عبدالرحمن عبيدالله



M. Sc. Final Examination
Subject: special course (G)

September 2015- Time allowed: 3 Hours

Answer only **four questions** out of the following (100 marks)

1. Write short notes on the following items (25 marks).

- a. Diagnostic sedimentary structures in carbonate supratidal zone (12.5 marks).
- b. The four separate stages of reef growth (12.5 marks).

2. Write briefly on following subjects (25 marks).

- a. Common diagenetic patterns characterizing shelf environment (12.5 marks).
- b. The different reef zones (12.5 marks).

3. Describe the following items (25 marks).

- a. Porosity and permeability in tidal flat systems (12.5 marks)
- b. Sedimentary structures characterizing the shelf environments (12.5 marks).

4. Write short notes on the following items (25 marks).

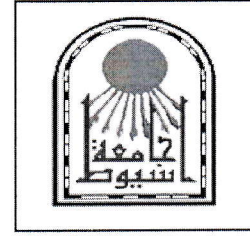
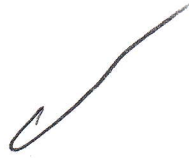
- a. The classification of different types of reefal carbonates (12.5 marks).
- b. Common diagenetic features of tidal flats (12.5 marks).

5. Write briefly on following subjects (25 marks).

- a. Composition and texture of pelagic sediments (12.5 marks).
- b. Sedimentary structures of pelagic sediments (12.5 marks).

Good luck

Dr. Abdalla El Ayyat



أمتحان تمهيدى الماجستير (دور سبتمبر ٢٠١٥)
المادة مقرر خاص (Geology of Gold)

الزمن : ثلاث ساعات

=====

Answer Four only of the following questions:

- 1- Explain the exploration criteria for the skarn gold deposits?
 - 2- Discuss the geology of Carlin Trend Gold Deposits?
 - 3- What are the advantages of the Nichromet Extraction Gold Technology?
 - 4- Write short note on the prospection for placer gold deposits?
 - 5- What is the Lode Gold?
-

أنتهت الأسئلة



امتحان درجة الماجستير (جيولوجيا) سبتمبر ٢٠١٥

الزمن:	الدرجة:	مقرر خاص (٦٤٥ ج)
ثلاث ساعات	١٠٠	

Answer the following questions:

1. Discuss briefly only TWO of the following: (33Mark)
 - a. Practical application of hydrogeology.
 - b. Measurement of rainfall.
 - c. Vertical distribution of the groundwater.
2. Give an account on only TWO of the following: (33Mark)
 - a. Definition of the groundwater aquifer parameters.
 - b. Water above earth's surface.
 - c. The global water budget.
3. Write short notes on the following: (34Mark)
 - a. Sedimentation of the reservoir.
 - b. Groundwater or subsurface water.

=====

Good Luck

Prof. El sayed Abu El Ella



Master Exam, September 2015

Course: **Special Course (Quaternary Palynology), G645**

Time Allowed: 3 Hrs

Total mark: 100 Marks

Answer the following question:

Question no. 1: (25 Marks)

- Stratigraphic and paleoecologic interpretation of recent sediments such as Pleistocene is always difficult especially if the investigated rocks are exclusively of terrestrial origin and exhibit great lithological variability. If you are asked to report on paleoecology of such rocks what are your research priorities and suggestions?

Answer ONLY THREE of the following questions:

Question no. 2: (25 Marks)

- Write a comprehensive article on the differential sorting of palynomorphs into sediments: palynofacies, palynodebris, palynomorphs.

Question no. 3: (25 Marks)

- A- Taphonomy of spores and pollen is essential in the reconstruction of paleoecology of Quaternary sediments, discuss this statement. **(15 Marks)**
- B- Quaternary angiosperm pollen are highly diverse and exhibit great morphological similarities, their biostratigraphic value is thus limited (✓ or X)? **(5 Marks)**
- C- Relative percentage frequencies of pollen communities may reflect climatic fluctuations and variability (✓ or X)? why? **(5 Marks)**

Question no. 4: (25 Marks; 12.5 Marks each)

- Write an article on:
 - A- Neogene palynology.
 - B- Factors affecting practical applications of the Quaternary palynology.

Question no. 5: (25 Marks)

Write in detail on:

- Production and dispersal of spores and pollen in relation to the interpretation of the Quaternary palynoflora.

أنتهت الأسئلة

Examiners: Prof. Magdy S. Mahmoud, Dr. Amr S. Deaf

Good Luck



Answer the following question:

Question no. 1: (25 Marks)

- Stratigraphic and paleoecologic interpretation of recent sediments such as Pleistocene is always difficult especially if the investigated rocks are exclusively of terrestrial origin and exhibit great lithological variability. If you are asked to report on paleoecology of such rocks what are your research priorities and suggestions?

Answer ONLY THREE of the following questions:

Question no. 2: (25 Marks)

- Write a comprehensive article on the differential sorting of palynomorphs into sediments: palynofacies, palynodebris, palynomorphs.

Question no. 3: (25 Marks)

- A- Taphonomy of spores and pollen is essential in the reconstruction of paleoecology of Quaternary sediments, discuss this statement. **(15 Marks)**
- B- Quaternary angiosperm pollen are highly diverse and exhibit great morphological similarities, their biostratigraphic value is thus limited (✓ or X)? **(5 Marks)**
- C- Relative percentage frequencies of pollen communities may reflect climatic fluctuations and variability (✓ or X)? **why? (5 Marks)**

Question no. 4: (25 Marks; 12.5 Marks each)

- Write an article on:
 - A- Neogene palynology.
 - B- Factors affecting practical applications of the Quaternary palynology.

Question no. 5: (25 Marks)

Write in detail on:

- Production and dispersal of spores and pollen in relation to the interpretation of the Quaternary palynoflora.

أنتهت الأسئلة

Examiners: Prof. Magdy S. Mahmoud, Dr. Amr S. Deaf

Good Luck



**Final Examination for Diploma and Master Students
(Special Course: Geographic Information Systems)**

September, 2015	Code: G 645	100 Points	Time: 3 Hours
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Answer only the required points to save your time.

Give full and clear answers supporting your answers with drawings when applicable.

- 1) Any geographic phenomena can be represented on computer by different ways, give notes on point, line and area representations of different geographic features (22 points)
- 2) Discuss the concept and types of map projection (28 points)
- 3) Give short notes on **SIX** only of the following: (30 points)
 - A. Spatial Data Analysis
 - B. Database Management Systems (DBMS)
 - C. Spatiotemporal data
 - D. Data storage
 - E. Topology
 - F. Spatial referencing
 - G. Vector representations
- 4) Define **FIVE** only of the following terms: (20 points)
 - A. Spatial database
 - B. Geographic phenomenon
 - C. TIN
 - D. Thematic feature
 - E. Datum
 - F. Geographic object

**Best Wishes
Dr. Ahmed Sefelnaasr**

بسم الله الرحمن الرحيم

Assiut University

Faculty of Science

Geology Department

جامعة أسيوط

كلية العلوم

قسم الجيولوجيا

امتحان الدراسات العليا
مقرر 645 جيولوجيا (مقرر خاص)

دورسبتمبر 2015

الزمن: ثلاث ساعات

ANSWER ONLY FIVE OF THE FOLLOWING QUESTIONS

QUESTION 1:

(20 marks)

1-A- Identify the Greenhouse Effect and its impact on global climate. Give one example on the effect of global warming on mass extinction during the geologic history

1-أ- عرف ظاهرة الدفينة (الصوبة الزجاجية) وتأثيرها على المناخ العالمي مع ذكر مثل واحد على تأثير هذه الظاهرة على الانقراضات الجماعية التي شهدتها التاريخ الجيولوجي

1- B- What are the sources of uncertainty of radiometric dating ?

1-ب - ماهى الصعوبات التي تواجه استخدام العناصر المشعة فى تأريخ الصخور

QUESTION 2:

(20 marks)

2- A- Suppose that the geologic time scale is only one year made up of 12 months starting from first January to end of December. Try to arrange successively the characteristic bio-events which occurred on the Earth during this time interval.

2 - أ - افترض أن التاريخ الجيولوجى للأرض هو عام واحد فقط مدته 12 شهرا يبدأ من يناير وينتهى فى آخر ديسمبر. حاول أن ترتب زمنيا بالتوالى الأحداث البيولوجية التى جرت على وجه الأرض خلال هذه الفترة الزمنية

2-ب- عرف مايلى

2- B- Identify the following:

- | | |
|--------------------------------|--------------------------|
| a) Fossil succession principle | قاعدة التتابع الحفرى |
| b) Chronostratigraphic units | الوحدات الطباقية الزمنية |
| c) Radioactive decay | الإضمحلال الإشعاعى |

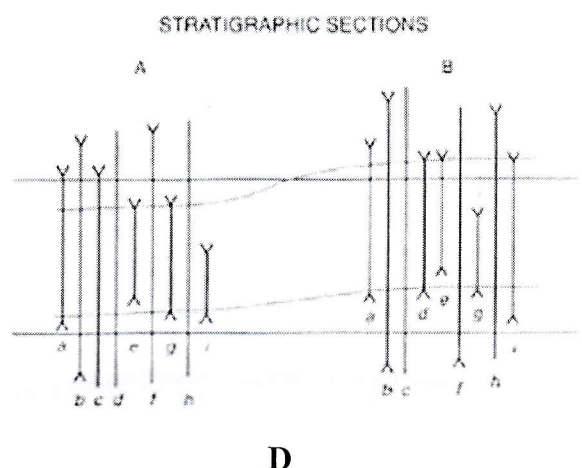
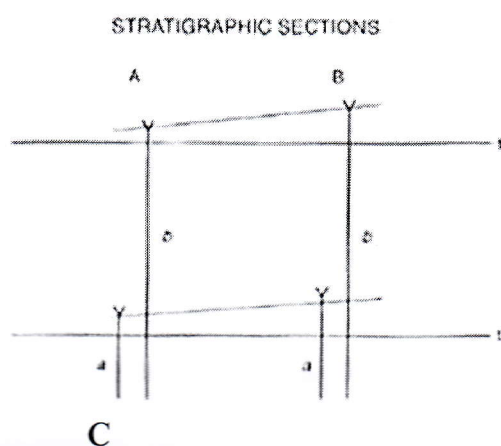
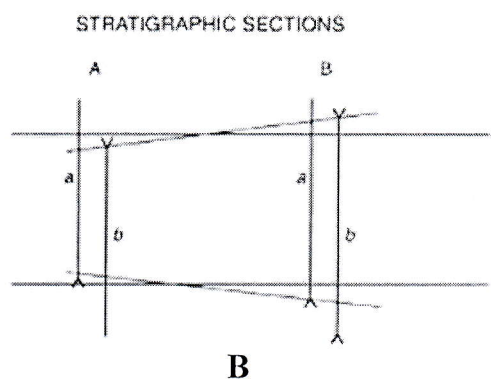
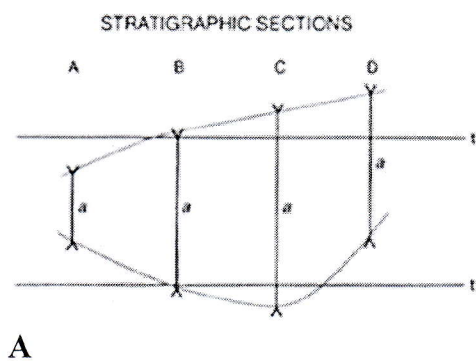
QUESTION 3:

(20 marks)

3-A: Define the kind of the biostratigraphic unit in the following diagrams A,B,C,D and E.

3- عرف نوع النطاق البيوستراتجرافى فى الأشكال الآتية

(أنظر باقى الأسئلة خلف الصفحة)



t: time surface

4-B-fill the empty spaces (1-8) by corresponding formal stratigraphic units

4-ب- إملأ المربعات الخالية بالوحدات الطبقيّة المناسبة

1	2
Eonthem	3
4	Era
5	Period
Series	6
7	Age
Substage	8

QUESTION 4:

(20 marks)

Advantages, disadvantages and limitations of paleopalynology.

QUESTION 5:

(20 marks)

A- Standard palynological processing technique.

(5 marks)

B- Safety precautions in the palynology lab.

(15 marks)

QUESTION 6:

(20 marks)

Morphology of spore and pollen grains (with drawings).

_____ *End of Exam, Good Luck* _____

Examiner: Prof. Dr. Khaled A. Ouda and Dr. Amr S. Deaf

(Geology Department)

Assiut University
Faculty of Science
Geology Department



جامعة أسيوط
كلية العلوم
قسم الجيولوجيا

Post Graduate Higher Diploma Final Examination (for Master Students)

Time: 3 hours	Seismic Methods (G638)	September, 2015
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ملحوظة : الإمتحان في سبع صفحات

PART ONE:

Answer (four ONLY) of the following questions (with illustration as it is possible)

- 1 Explain the differences between homogeneity and isotropism.
- 2 Measure the similarity or time alignment of the two traces wavelet 1: (2,1,-1,0,0) and wavelet 2: (0,0,2,1,-1) using crosscorrelation process and show how much the two time series resemble each other and determine the time lag at which they are mostly similar.
- 3 For determination of the hydrogeologic surfaces write about :
 - The physical bases for characterizing the water table level in sedimentary and hard rocks using seismic waves.
 - Polarization and registration of different types of seismic waves.
- 4 In the field seismic survey, write about the following:
 - the meaning of spread and profile.
 - different observation systems used for refraction and reflection measurements.
- 5 Write about phase velocity, group velocity and RSM velocity
- 6 write about the characteristics of the raypath in anisotropic medium.

End of Part One's questions

GOOD LUCK

Prof. Dr. Assem El-Haddad

PART TWO:

Answer all of the following questions after reading carefully the following research paper

- ❖ Propose two suitable titles for this research paper.
- ❖ Write a detailed abstract.
- ❖ Put in historic order the different methods and techniques used in detection of ground water level.
- ❖ In Figure 9, illustrate in detail the different seismic phases and show the corresponding travel time - distance curve.
- ❖ Evaluate and comment the present research work showing its advantages, disadvantages, importance, and possibility in practice.
- ❖ Explain how could we use Figure 14.
- ❖ Depending in Figure 9, show a schematic representation for the field strategy of the observation system during P-wave and S-wave field survey.

End of Part Two's questions

GOOD LUCK

Dr. Mostafa Thabet

1. Introduction

The relationship between lithological proprieties and body wave velocity has been explored, for many years, as a means of indirectly characterizing porous aquifers. In existing literature, different approaches have been proposed: in some cases the water table level is attributed to specific VP values (Zohdy et al., 1974; Sander, 1978; Haeni, 1986; Hasselstroem, 1996); while in others, the hypothetical aquifer layer is identified via its VP/VS ratio (Stümpel et al., 1984; Castagna et al., 1985; Nicholson and Simposon, 1985) or Poisson's ratio (Lees and Wu, 2000). In addition, more complex theory-based approaches exist which derive from the principles of the elastic wave propagation within saturated and unsaturated porous media (Foti et al., 2002). These approaches require a preliminary and detailed knowledge of the lithological sequences of the site under investigation. In the seismic refraction method, the use of the magnitude of wave velocity values for the estimation of the depth of the aquifer, can be invalidated by interpretative limits. In fact, case histories show a wide range of VP values in connection to the water table level. In addition, these values are not uniquely correlated to the aquifer layer. Some authors attribute P-wave velocities around 1500 m/s to represent a saturated layer. Instead Hasselstroem (1969) proposes a P-wave velocity between 1200 and 1800 m/s in porous materials. This non-unique value of VP is confirmed by Haeni (1986) for New England glacial materials. Tomographic studies show that the water table corresponds to a P-wave velocity of 1100–1200 m/s (Azaria et al., 2003; Zelt et al., 2006), with values as low as 1000 m/s (Watson et al., 2005). Theoretical approaches demonstrate that in a sandy deposit, the maximum increase of VP, occurs at a water content corresponding to a saturated state, $S_r=1.00$, where S_r is the degree of saturation (Biot, 1956a,b; 1962). Laboratory experiments (Yoshimi et al., 1989) show that “low saturation” in sand, is related to VP significantly smaller than 1500 m/s. This is due to the fact that the attainment of this value is defined by the relationship $(1-S_r)^{0.10-0.5}$. In reference to the aforementioned, Bachrach and Nur (1998) highlight that in field investigations, reflections as well as refractions are influenced by the degree of saturation. In addition, they show how VP is influenced by pore-water pressure. The methodology presented in this paper, attempts to define an index parameter directly related to the depth of the water table. The “Water Seismic Index” (WSI) is theoretically derived from the propagation of elastic body waves in 2D or 3D spatial models of water table surfaces in unsaturated–saturated interfaces. This study was carried out utilizing seismic refraction investigations to obtain the spatial distribution of VP and VS values. Field tests were performed in areas with known lithological and hydrogeological conditions.

2. Methodology

The refraction method is widely used for the characterization of groundwater depth. In particular, in porous soils, the unsaturated vs saturated interface, is a refracting surface, efficaciously detected by the afore-mentioned exploration method (Haeni, 1988). Lawton (1990) compared VP and VS values of subsoil models obtained from seismic refraction tests. In some cases, he highlighted that the resulting higher number of VP seismic-layers, was due to the presence of a groundwater table (Fig. 1). The compressional-waves and shear-waves propagation modality, which was confirmed by field tests, indicates that VP should increase at the transition from unsaturated to saturated layers. This transition zone does not seem to be influenced by VS (Stümpel et al., 1984). The “Water Seismic Index” (WSI) is an estimator parameter that was created in relation to these proprieties. It is defined by the equation:

$$WSI = \left(\frac{z \delta V_p}{V_p} \right) \cdot \left[1 - \left(3 \frac{z \delta V_s}{V_s} \right) \right]; \quad (1)$$

where VP and VS are, respectively, the compressional and shear waves velocity, expressed in m/s, and z is depth, expressed in m. The coefficient “3”, discussed below, aims at giving a correct load to the VS variability. In particular, it is correlated to the most recurrent values in the VP/VS ratio for granular soils in the near surfaces (Stümpel et al., 1984). In synthesis, the WSI considers the combined local spatial distribution of VP and VS values with depth; the objective is to obtain a parameter which is indicative of the presence and depth of the water table. The WSI formulation takes into consideration the general increase of absolute body wave velocities in relation to depth. If this does not occur, a non-uniform response by the WSI along the depth direction, can result. Fig. 2, shows the pattern $\delta V/V$ of the generic variable ratio (1) and the corresponding normalized variable $z \delta V/V$ (2), in the condition of the $\delta V/\delta z$ gradient, which is positive and constant except for three points z_1 , z_2 and z_3 along the depth direction. Having imposed an elevated and equal value of δV around these points, curve (2), in contrast to curve (1), shows peaks which are similar to one another. The normalization operation led the WSI to be expressed by the surface dimensional unit. The WSI formulation lends itself well to being interpreted via 2D or 3D tomography methodology. A bi-dimensional analysis requires that every node (i,j) must have overlapping VP(i,j) and VS(i,j) values (Fig. 3) for an assigned x–z grid (x: seismic line direction and z: depth direction). In this context, the WSI is defined by the reciprocal local variation of the compressional and shear velocity along the z direction (i–1, i), for every range (j–1, j). Therefore, the equation is:

$$WSI = \left(\frac{z_{i,j} (V_{p(i,j)} - V_{p(i-1,j)})}{V_{p(i,j)}} \right) \cdot \left[1 - \left(3 \frac{z_{i,j} (V_{s(i,j)} - V_{s(i-1,j)})}{V_{s(i,j)}} \right) \right] \quad (2)$$

in the condition that $(z(i,j)-z(i-1,j))=\delta z$ is a constant. The more the effect of the δz grid value on the WSI increases, the greater is the gradient $\delta V/\delta z$ before and after the seismic layer variation. However, as shown in Fig. 4, the choice of different grid δz ranges determines the small variation of the $z\delta V/V$ peak and therefore of the WSI values, taking into consideration that the choice of the δz is suitably conditioned by the intergeophone distance. The WSI is characterized by a finite domain, in which the values can be referable to particular lithological and hydrogeological conditions. In fact, in mathematical terms, the local independent variations of the δVP and δVSH , are characterized by the number of possible combinations equal to 32 (Table 1). Instead, taking into consideration the lithological and hydrogeological sequences which constitute the subsoil, fewer combinations are obtained. This is defined by the following WSI range values (Table 1): i. close to zero, in relation to (1) small increase or decrease of the δVP and δVSH values, which correspond to the inter-layer condition, or (2) to the increase of both the δVP and δVSH values, which correspond to the lithological variation. ii. negative, in relation to (3) the decrease of both the δVP and δVSH values, which correspond to the lithological variation characterized by an inversion seismic velocity of the layers. iii. positive, in relation to (4) the univocal increase of the δVP values, which correspond to the water table presence. Additionally, interlayer conditions under the water table level are referable to the above-mentioned points, i. and ii. With regards to this subject, the WSI behaviour in relationship to some 1D patterns of P and S-wave velocities which are hypothetically extracted from 2D seismic refraction tomography models. Post-analysis processing was used in the following illustrated experimentation. In reference to Table 1, the aim of the tests was to provide two pieces of interdependent information. The first was the verification of the peak values of the WSI in connection to the depth level of a known water table. The second was to determine the lower limit ϵ value which identifies the minimum positive value of the WSI in relation to the presence of the groundwater level.

3. Experimental areas

The seismic refraction tests were performed in three different locations, during the period June–July 2007. The geological sequences of these locations were known. Furthermore, it was possible to verify the water table depth using piezometers, installed at the site, during the field tests. The S1, S2 and S3 test-locations were situated in the southern Italian region of Campania's Appennines. They were lowland-sites, and were characterized by granular soil and clay sequences, which are typical of alluvial valleys or, in general, to Plio–Quaternary natural-fills of ancient morphological depressions. In contrast to S1 and S2, the lithological sequence of S3 was characterized by a lateral and vertical heteropy between gravel–sands and clay (Giocoli et al., in press). Furthermore the three localities were characterized by overlapping pluriaquifers. The tests were performed in relation to the highest aquifers. From the borehole prospecting performed, the three localities presented the following lithological sequences: S1 “Cubante Plain” site: piroclastic deposits on sand–gravels and silt–sands sustained by clay and stiff clay; S2 “Dragone Valley” site: a thick piroclastic sequence characterized by thin interlayers of peat and fluvio-lacustrine deposits. S3 “Ufita Valley” site: fluvio lacustrine deposits characterised, in the superior part of the sequence by sand and gravel sand with clay lenses, sustained by clay and boulder clay deposits. In particular, the highest aquifer, is fed by the Ufita River and is interconnected locally with the deeper aquifers.

4. Experimental procedure

In order to determine the travel times of P-waves and SH-waves, the seismic refraction tests were carried out by two overlapping linear arrays. These arrays were equipped with twenty-four vertical and horizontal mono-component geophones with a resonant frequency of 10 Hz. The horizontal geophones were orientated orthogonally to the seismic line; these geophones were equipped with a levelling bubble and an arrow for orientation. Time zero was established by a trigger geophone positioned near the sources. Two different types of sources were used for P-waves and S-waves generation. The scheme related to the disposition of the five sources along the arrays used in the tests. In particular, two sources were positioned externally to the most extreme geophones, at a distance which was equal to half the intergeophone distance. The other sources were positioned at the following distances: one at 1:4, one at 1:2 and one at 3:4 of the linear array. The intergeophone distances used were 2.00 m at the S1 site, 2.50 m at the S2 site and 4.00 m at the S3 site. The P-wave source consisted of a 10 kg steel hammer which struck against an aluminium plate. Great care was taken in the production and acquisition of SH-waves. The SH-waves were produced by a portable apparatus specifically built for the purpose. It consisted of a wooden block, weighed down for intimate contact. The block was positioned with the length orthogonal to the seismic line. The shear waves were produced by the steel hammer which, in alternating movements, struck the lateral surface. P and S wave-field separation techniques were used to minimize the hidden or equivocal phenomena regarding the arrival of the first-breaks of the SH-wave (Hasbrouk, 1987). This technique consisted of multi-signal recording obtained from the subtraction (sum inverted) of the traces produced with inverse polarization. Fig. 9 shows the traces produced by the P wave source and the SH wave source and the related first breaks singled out for the S1 site.

The VP and VSH 2D refraction tomography models were obtained via the Rayfract code. This is an inversion system based on "wave path eikonal travel time" (WET) devised by Schuster and Quintus-Bosz (1993). This method utilizes a back-projection formula of finite differences based on the eikonal equation (Qin et al., 1992). The procedure foresees that an inversion routine adjusts the initial velocity model until an acceptable match between the calculated and measured first-arrival travel times is obtained. The initial velocity model is defined by a 1D gradient which is then extended to cover the two-dimensional area.

5. Results and discussion

The 2D travel time tomography of the P and SH velocity related to the S1, S2 and S3 arrays. An initial comparison between the compressional waves and the aquifer layers, highlights values ranging from 1200 to 1400 m/s for S3, in accordance with the results of Hasselstroem (1969) and Haeni (1986). In contrast, for the S1 and S2 arrays, this velocity is close to or less than 1000 m/s. For these latter localities, the lithological sequences identified thin higher aquifer layers for which it was possible to hypothesize non-uniform saturated conditions. A comparison between the theoretical (synthetic) and experimental first-arrival times, highlights a fitting with an average residual time of less than 2.00 m/s, with the exception of the fitting related to the VSH of S2 (with an average residual time of 8.09 m/s). In general terms, due to the combinatorial character of the Eq. (1), the WSI model error results as being connected to the greatest value between the average residual times of the VP and VSH spatial models. In addition, it is important to highlight that, in this context, the inverse problem of refraction travel time, as in many other geophysical investigation methods, can be affected by non-uniqueness model results (Ackerman et al., 1986; Ivanov et al., 2005). The WSI one-dimensional analysis, extracted from the WSI two-dimensional distribution, demonstrates how the peak values correspond to the presence of the water tables, for each experimental case. Furthermore, it highlights that $\varepsilon \approx 0.5$ can be considered as the threshold which indicates the existence of the water table. Based on both the presuppositions reported in Table 1 and the established ε value illustrates the chromatic variation related to the WSI two-dimensional distribution for each experimental-site. In this context, the WSI water table models (WSI N0.5) are characterized by horizontally developed and near continuous areas. The WSI spatial models can agree with the modality of the groundwater circulation. In particular: - In site S1, the different depths resulting from the WSI water table model, is related to the non uniform lowering of the water table during the dry period. This induces a local and momentary suspension condition of the water table. - In site S2, the WSI water table model primarily shows a uniform and horizontal distribution of the water table; this is in accordance with the water circulation in the aquifer layer. - In site S3, the spatial distribution of the WSI seems to be concordant with groundwater circulation. In fact, as previously stated in this paper, the aquifer layer is characterized by lateral and vertical variations of granular soils and clay. Studies, related to refraction seismic tests, have illustrated the variation of P-waves and S-waves velocity in granular soils and in clay. In particular, Stümpel et al. (1984) discussed the behaviour of the afore-mentioned velocities in dry and saturated conditions. Fig. 14 shows a high increase of VP and an unchanged value of VS between the dry and saturated sand. Inversely, the saturated clay shows both a greater ratio VP/VS and also greater values of VS in comparison to saturated sand. Taking this into account, as well as the water circulation modality in granular soils and in clays, the spatial behaviour of the WSI can be characterised as follows: i. In clays, the suction phenomenon determines a gradual variation of the water content during the transition between the upper zone and the lower zone of the water table. It involves lower δVP values for suitable δz values. In contrast, the suction is weak in granular soils. This determines a greater propensity of the WSI for the investigation of water tables in such soils. ii. The VS increase during the transition from saturated sands to clay, and the VS decrease in the inverse transition, determine two different behaviours of the WSI. In both cases, a fundamental role is provided by the ratio 1:3 between δVP and δVS (Eqs. (1) and (2)). In the first case, the WSI shows values close to zero, negative, or less than ε . In the second case the WSI shows positive values which can also exceed ε . Bearing these observations in mind, it is possible to hypothesize that the WSI individualizes granular aquifers inside a saturated granular soil-clay sequence. In reference to site S3, the negative values of the WSI correspond to clayey sublayers inside the aquifer layer and to the clayey bed layer. Greater variability of the WSI in relation to the VP/VSH and the dynamic Poisson's ratio. In particular, these last two parameters do not show any peak condition or evident increase of their pattern in correspondence to the water table.

6. Conclusions

The traditional parameters resulting from seismic refraction tests do not always provide exhaustive and above all unequivocal information about groundwater levels. The WSI formulation gives direct information both on the existence and on the level of the groundwater table. This is due to the fact that it is based on a different modality which regulates the propagation of the compressional and shear waves in the physical media. Furthermore, its mathematical form requires a spatial distribution of body wave velocity. This requires a tomography analysis of data and therefore a seismic refraction array related to the P and SH travel time waves acquisition. The application of the methodology in three areas permitted

the determination of the positive minimal $\epsilon \square$ values of the WSI correlated to the groundwater level. In addition, the two-dimensional distribution of the WSI demonstrated that $\epsilon \square$ is exceeded only in relation to saturated granular soils. However, in relation to clayey soils, the WSI showed values less than $\square \square$ and frequently negative. This behavior is corroborated by literature regarding correlations between body wave velocity and lithology, in relation to the dry and saturated condition. In conclusion, this study highlighted that the WSI is more susceptible to lithology and the unsaturated-saturated transition layer than to the VP/VS and Poisson's ratio.

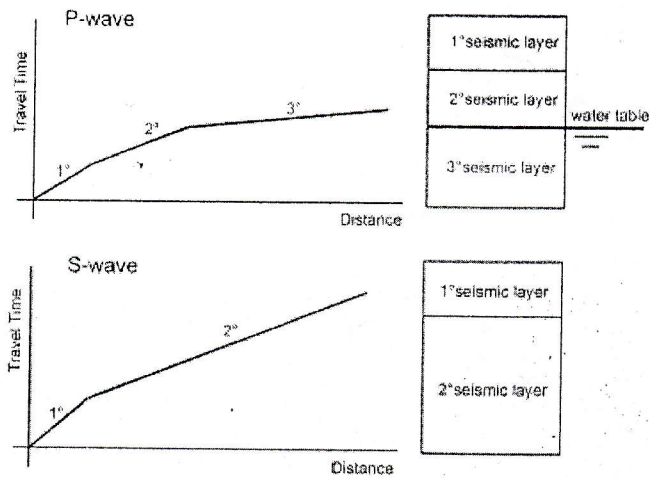


Fig. 1. P-wave and S-wave travel time patterns related to a multilayer sequence with water table presence.

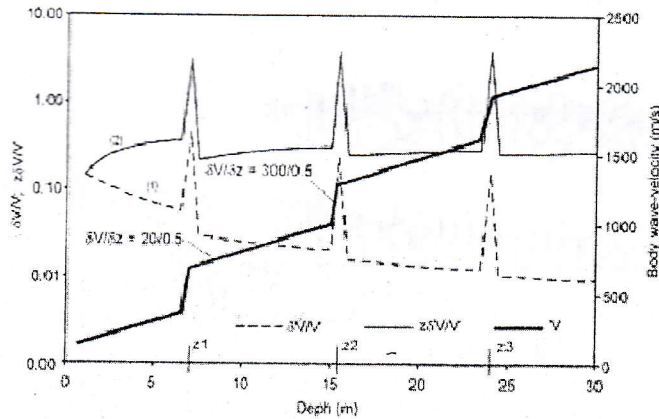


Fig. 2. Pattern of the generic variable function (1) and (2) in relation to velocity vs. depth pattern.

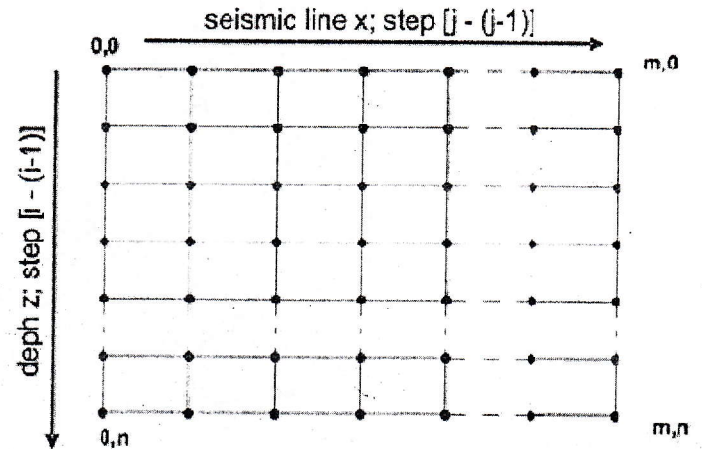


Fig. 3. Two-dimensional grid of the WSI distribution.

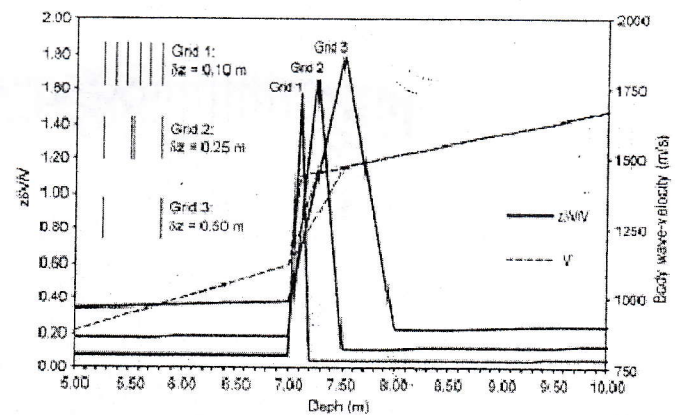


Fig. 4. Variation of the $\delta V/V$ in relation to the δz grid.

Table 1
Mathematical combination of the P waves and S waves velocity, in relation to lithology and hydrogeology transition and WSI value range results; where: $\uparrow$ increase; $\downarrow$ decrease; $\uparrow$ weak variation; $\epsilon - \delta$ and $\epsilon < \epsilon^* < \delta$

Relation	$\delta V_P(u) = (V_P(u) - V_P(i-u))$	$\delta V_S(u) = (V_S(u) - V_S(i-u))$	WSI range	Condition	Combinations
1	$\uparrow$	$\uparrow \downarrow$	$[-\epsilon, \delta]$	Interbed or layer shift (rigidity variation)	3
2	$\uparrow$	$\uparrow$	$[-\epsilon_1, \delta]$	Layer shift	1
3	$\downarrow$	$\uparrow \downarrow$	$[-\epsilon_1, -\delta]$	Layer shift (velocity inversion)	3
4	$\uparrow$	$\uparrow \downarrow$	$[\epsilon^*, \delta_1]$	Water table presence	2

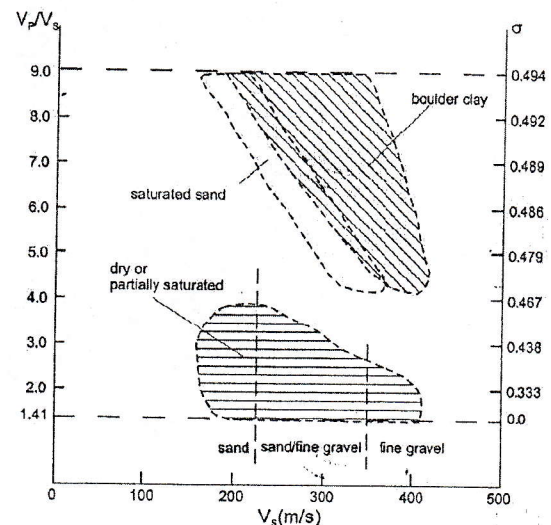


Fig. 14. V_P/V_S and Poisson's ratio (σ) versus V_S for some soils from in-situ measurements (modified by Stümpel et al., 1984).

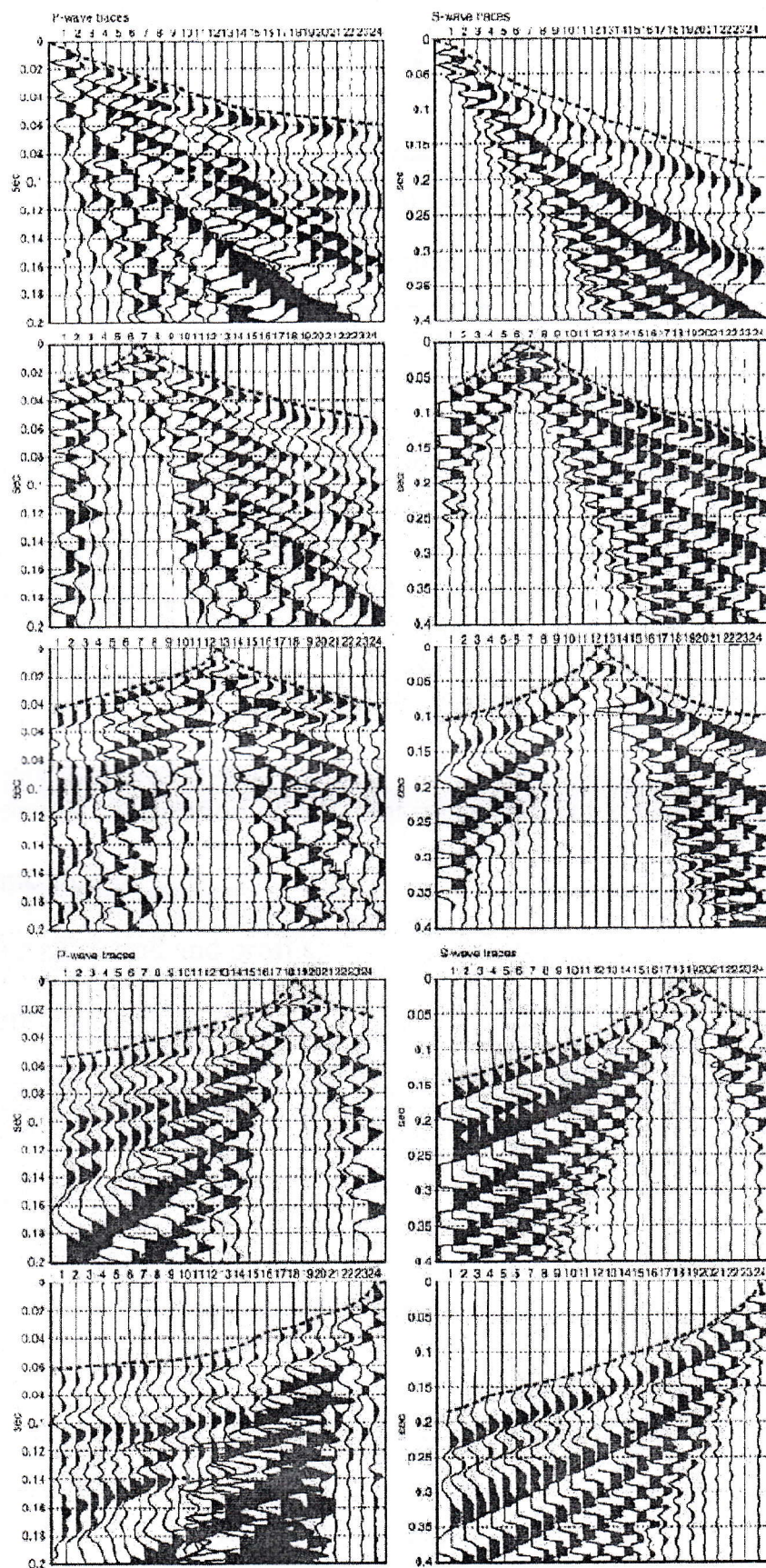


Fig. 9. Seismograph records and first-break selection of P and SH waves: resulting from S1 site tests.



إمتحان تمهيدى ماجستير جيولوجيا

الزمن: ثلاث ساعات	المادة: ترسيب (606 G)	16 سبتمبر 2015
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Part I. PRINCIPLES (50 Marks)

Answer the **FIRST QUESTION** and **TWO ONLY** of the others:

Write briefly on of the following:

1. Fluvial environments and facies. (18 Marks)
2. Evaporite deposits and depositional environments. (16 Marks)
3. The characteristic features of the depositional environments of marine carbonates and carbonate platform. (16 Marks)
4. The characteristic features of the depositional environments of intertidal-subtidal carbonate sand bodies. (16 Marks)

Part II. APPLICATIONS (50 Marks)

Answer the following questions, illustrating your answers by diagrams wherever possible.

1. "Tectonics and nearby source areas affected the sedimentation and facies distribution of the carbonate-evaporite-siliciclastic system of the unstable coastal areas of the Red Sea Rift".

Explain the above-mentioned statement. (25 Marks)

2. Describe in some detail how sedimentary environments were identified in the stable Eocene carbonate platform of **ONE ONLY** of the two areas you studied in the Nile Valley. (25 Marks)