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The Open University of Sri Lanka
Faculty of Natural Sciences
B.Sc. Degree Programme

Department	: Physics
Level	: 5
Name of the Examination	: Final Examination
Course Code and Title	**: PYU3266 Essentials of Geology**
Academic Year	: 2019/20
Date	: 28.12.2019
Time	: 9.30 am- 12.30 am
Duration	: 3 hours

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **nine (09)** questions in four (04) pages.
3. Answer any **six (06)** questions only selecting ***Two (02)*** questions from each of the sections **A, B** and **C**. All questions carry equal marks.
4. Answer for each question should commence from a new page.
5. Draw fully labelled diagrams where necessary
5. Relevant log tables are provided where necessary.
6. Having any unauthorized documents/ mobile phones in your possession is a punishable offense
7. Use blue or black ink to answer the questions.
8. Circle the number of the questions you answered in the front cover of your answer script.
9. Clearly state your index number in your answer script

SECTION A - Earth and Surface Processes

1. (i) Describe the Earth's internal energy source/s? *(25 marks)*

(ii) What is the Moho discontinuity, and how is the depth to the Moho discontinuity determined? *(25 marks)*

(iii) How do we investigate the properties of the Interior structure of the Earth? *(25 marks)*

(iv) Why is the crust thinner under the oceans than under the continents? *(25 marks)*

2 (i) What is plate tectonics and how is it discovered? *(25 marks)*

(ii) Describe the three types of plate boundaries. *(25 marks)*

(iii) What happens at each of these plate boundaries? *(25 marks)*

(iv) At one of these plate boundaries, three types of collisions occur. Describe

(a) The type of collision

(b) The major geological features formed by each type of collision *(25 marks)*

3. (a) Discuss, how bio-stratigraphy (fossils) is used as evidences for relative dating of a rock sequence. *(25 marks)*

(b) Describe the use of radioactive methods in geo-historical calculations *(25 marks)*

(c) Suggest a possible radioactive method to calculate the ages of *'inland corals'* located in the south western part of Sri Lanka. *(25 marks)*

(d) What is "Sea Floor Spreading"? How can Magnetic Rocks provide Evidence for Sea Floor Spreading? *(25 marks)*

SECTION B – Earth Materials

4 (i) List and briefly describe the various types of silicate mineral structures based on the SiO_4 tetrahedron. *(25 marks)*

(ii) How do you identify following minerals in the laboratory/field?

a. Pyroxene from Amphibole
b. Gold from Pyrite
c. Beryl from Apatite
d. Feldspar from Quartz
e. Graphite from Molybdinite *(5 marks each)*

(iii) How does 'fracture' differ from 'cleavage'? Explain the answer with Examples. *(25 marks)*

(iv) "Chert, agate and pearl are considered as mineraloids". Explain why each of them are not considered as minerals with the help of mineral definition. *(25 marks)*

5. (i) List at least three type of chemical sedimentary rocks. Explain, which minerals they contain and how they might be formed. *(25 marks)*

(ii) Explain the Bowen's Reaction Series with suitable diagram? *(25 marks)*

(iii) Explain why quartz grains are 'survived' than feldspar at the surface? *(25 marks)*

(iv) What is meant by a "pegmatite" deposit? Name at least three economically important minerals that are found in exploitable concentrations in a pegmatite. *(25 marks)*

6. (i) Define the metamorphism rocks? Explain the different types of foliated metamorphic rocks with respect to its characteristic metamorphic grade and grain size variation. *(25 marks)*

(ii) Define the following:

(a) geothermal gradient
(b) rock texture *(25 marks)*

(iii) Describe the formation of obsidian. *(25 marks)*

(iv) What are the basic structural building blocks of clay minerals? *(25 marks)*

SECTION C – Geology of Sri Lanka and Mineral Resources

7. Define the following terms used in geology.

(i) (a) heavy minerals

(b) concentration factor *(25 marks)*

(ii) Compare and contrast the rocks from Highland Complex and Vijayan Complex in terms of age of deposition, age of metamorphism, metamorphic grade, lithology and mineral resources? *(25 marks)*

(iii) What do you mean by the Pan-African event? *(25 marks)*

(iv) How has the development of plate-tectonic theory aided in finding more ore deposits? Discuss the answer with respect to Sri Lankan crust *(25 marks)*

8. (i) What is the difference between the zone of aeration and the zone of saturation? *(25 marks)*

(ii) State Darcy's law. Draw a labelled diagram of a Darcy tube, and label the variables used in Darcy's law. *(25 marks)*

(iii) List the main river/s associated with the following hydropower projects in Sri Lanka

a) Samanalawewa

b) Rantambe

c) Moragahakanda

d) Laxapana

e) Polpitiya *(5 marks each)*

(iv) What geological factors would you consider when you design damsites and reservoirs? *(25 marks)*

9.(i) Explain the formation of Cauvery basin between Sri Lanka and India and discuss the prospect of oil/gas reserves in that geological unit. *(25 marks)*

(ii) From what materials is coal formed? How does its quality change with progressive heating? *(25 marks)*

(iii) Describe the processes through which major mineral deposits are formed? *(25 marks)*

(iv) What is an ore? How is its concentration factor defined? *(25 marks)*