The Open University of Sri Lanka
B.Sc. Degree Programme (Level – 05)
PHU5306 – Applied Geology
Final Examination 2024/25

Date: 28th May 2025 Time Allowed: 2 hours (9.30-11.30)

Paper consists of ***Six (06)*** questions. Answer ***Four (04)*** questions. Answers should be illustrated with sketch maps and diagrams where appropriate. Each question carries equal marks.

1. (i) What are the igneous and sedimentary rocks found in Sri Lankan crust? *(5 marks)*

(ii) Compare and contrast the rocks from Highland Complex and Vijayan Complex of Sri Lanka in terms of age of deposition, age of metamorphism, metamorphic grade, lithology and mineral resources? *(10 marks)*

(iii) Explain the formation of serpentinite deposit at Ussangoda? *(5 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 *(5 marks)*

2 (i) What is the cause of 'asterism' (star effect) in corundum? Give evidences for presence of minerals leading to star effect. *(5 marks)*

(ii) Explain the theory behind the polariscope and the refractometer. *(10 marks)*

(iii) List the technique (s) used to distinguish between:
(a) ruby and garnet
(b) diamond and zircon *(10 marks)*

3. (i) How do you define a 'gem mineral' and how is it differing from a 'mineral' definition? *(5 marks)*

(ii) Discuss the three main parts in faceted gemstones. *(5 marks)*

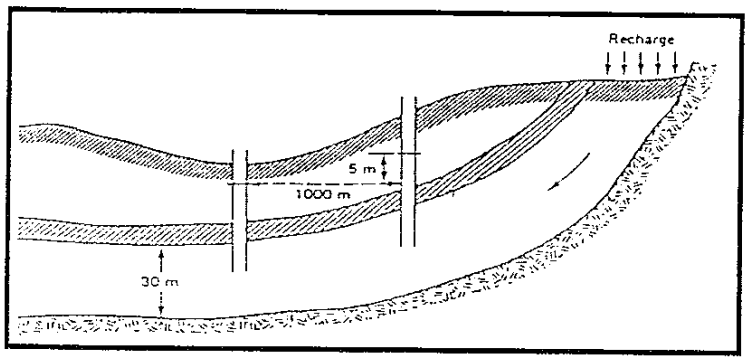
(iii) Discuss main gemstone enhancing methods with reference to enhancing of ruby, topaz and sapphires *(10 marks)*

(iv) Why are gems and gem minerals rare? *(5 marks)*

4. (i) What is the difference between the confined and unconfined aquifer? *(5 marks)*

(ii) State Darcy's law. Draw a labelled diagram of a Darcy tube, and label the variables used in Darcy's law. *(5 marks)*

(iii) A confined aquifer has a source of recharge. K for the aquifer is 50 m/day, and n is 0.2. The piezometric head in two wells 1000 m apart is 55 m and 50 m respectively, from a common datum (See figure below).



**assume no dispersion or diffusion*

The average thickness of the aquifer is 30 m, and the average width of aquifer is 5 km. Compute:

a) The rate of flow through the aquifer

b) The average time of travel from the head of the aquifer to a point 4 km downstream

(15 marks)

5 (i) Explain why petroleum resources are confined to Cenozoic age whereas coal resources are confined to Carboniferous age *(5 marks)*

(ii) List suitable reservoir rocks, source rocks and cap rocks defined in petroleum generation *(5 marks)*

(iii) Imagine that you found gold flakes in an ore body. Calculate how much gold in the 100 g of ore body is required to mine gold profitably (concentration factor of Gold is assumed as 1250) *(5 marks)*

(iv) Explain the formation of hydrothermal ore deposits and give three examples from Sri Lanka for such deposits *(10 marks)*

6. (i) What are the special characteristics of titanium metal that is extracted from rutile and ilmenite? *(5 marks)*

(ii) The principal source of phosphorous compounds is phosphate rock containing the mineral fluoro-apatite. Describe the advantages of using single superphosphate (SSP) and using balanced chemical equation show how SSP can be produced from fluoro-apatite. *(5 marks)*

(iii) The mineral sands are generally found in areas on or closer to the beaches and in sand dunes. Sri Lanka has one of the richest mineral sand deposits in the world. What do you mean by the term 'mineral sands'? Name three (03) main mineral sands found in Pulmudai. Sri Lanka and describe value addition technique of one (01) of the minerals (only steps are required) *(15 marks)*