

The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Civil Engineering



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| Study Programme | : Bachelor of Science Honours in Engineering |
| Name of the Examination | : Final Examination |
| Course Code and Title | : CVX4446 Construction Engineering and Materials |
| Academic Year | : 2023/2024 |
| Date | : Friday, 7 th March 2025 |
| Time | : 0930-1230hrs |
| Duration | : 3 hours |

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of Eight (8) questions in Five (5) pages.
3. Answer a total of **Five (5) questions**. All questions carry equal marks.
4. Answer for each question should commence on a new page.
5. This is a Closed Book Test (CBT).
6. Do not use Red colour pen.

Q1.

- (a) Concrete is indeed is one of the most widely used material in the entire world. Briefly explain why concrete is so popular as a construction material. (5 marks)
- (b) Briefly explain how properties of concrete such as workability and compressive strength are measured. (05 marks)
- (c) Briefly explain five factors affecting compressive strength of concrete. (05 marks)
- (d) State the details that should be considered and planned by the contractor to ensure pumping of concrete is carried out correctly in the construction of a high-rise building. (05 marks)

Q2.

- (a) Explain the differences between 'rigid pavements' and 'flexible pavements' in highway construction. (05 marks)
- (b) Briefly explain the four main elements of a flexible pavement of a road. Illustrate your answer with a neat sketch. (05 marks)
- (c) Pumps are used extensively in the construction sector for various purposes. Briefly explain three types of such pumps and their usage in the industry. (05 marks)
- (d) Briefly explain three types of macadam bases used in road construction. (05 marks)

Q3. Answer the following questions with illustrations where necessary:

- (a) Briefly discuss five important factors to be considered before commencing excavations adjacent to existing buildings. (05 marks)
- (b) Briefly explain three different types of formworks used in concrete work. (05 marks)
- (c) Hauling and hoisting of material and machine parts are essential in construction work. Briefly explain four equipment used for this emphasising on their purpose of use. (05 marks)

- (d) Choosing the right foundation is a highly technical decision that is to be made by engineers. As an engineer how do you recommend a suitable foundation for your client based on the given ground conditions. (05 marks)

Q4.

- (a) There are two generally used systems of supplying water to buildings namely, the direct system, and the indirect system. Explain these two different systems emphasizing on their usage. (05 marks)
- (b) Explain the differences between 'friction piles' and 'end bearing piles' with respect to the load transfer. (05 marks)
- (c) Joints in concrete construction are placed in concrete slabs and pavements at regular intervals to prevent development of cracks in concrete. Briefly explain the following joints with help of a neat sketch(s). (05 marks)
- I. Construction Joints
 - II. Expansion Joints
 - III. Contraction Joints
 - IV. Isolation Joints.
- (d) Considering strength and durability the concrete has been a cornerstone of construction for centuries. However, its environmental footprint has often been a point of concern. Briefly discuss how concrete can be made more sustainable to reduce environmental impact. (05 marks)

Q5. Cement, lime and sand constitute the fundamental components essential for making cement/lime mortars used in masonry and plastering work.

- (a) State four (04) hardened state and four (04) fresh state properties of sulphate and chemical resistant concrete. (05 marks)
- (b) Explain what is meant by adulteration of cement. Describe how you would identify whether a particular sample of cement has been adulterated. (05 marks)
- (c) Describe how slaked lime is prepared using tank slaking method. (05 marks)

- (d) Describe a simple test to differentiate between calcareous lime and magnesium lime. (05 marks)

Q6. Clay bricks and cement blocks are commonly used for constructing exterior and interior walls, partition walls, piers, and other load bearing structures.

- (a) Briefly explain the harmful ingredients in good brick earth, emphasizing on how they affect the properties of bricks. (05 marks)
- (b) Describe a simple test to determine the degree of water absorption of bricks in the laboratory. (05 marks)
- (c) State the measures that should be taken to ensure manufacture of quality cement blocks. (05 marks)
- (d) The use of cement stabilized soil blocks is becoming popular nowadays due to the green building concept. Explain how you would ensure manufacturing quality cement stabilized soil blocks. (05 marks)

Q7. A hotel complex is to be expanded by building up a series of double storey cottages which are presently at their finishing stage.

- (a) The staircase railings are to be made from Mahogany timber. Explain how the new wooden surface which is to be polished should be prepared for the application of French polish. (05 marks)
- (b) Plywood doors are considered for all the internal doors. Explain how plywood is produced, and state four (04) advantages of plywood. (05 marks)
- (c) Fibreglass roof sheets have been proposed for roofing material in place of asbestos roofing sheets. Describe the low-pressure technique of fibreglass production, and state four (04) advantages of fibreglass roofing over asbestos roofing. (05 marks)
- (d) Emulsion paint has been proposed for both exterior and interior walls of the cottages. State the essential constituents of a paint and their role. (05 marks)

Q8. Geosynthetics are materials used in various civil engineering applications associated with earthworks such as earth reinforcement, separators between road subgrade and base layer, filtration etc.

- (a) Weaving is one of the traditional methods of producing textiles for making geosynthetics. Describe different types of weaving techniques available to produce geosynthetics. (05 marks)
- (b) Explain the difference between geomats and geomeshes. Also give two (02) applications of each. (05 marks)
- (c) Explain three (03) characteristics of geosynthetics that make them suitable for soil reinforcement applications. (05 marks)
- (d) A geotextile is to be embedded to the rear side of a retaining wall. Explain the two (02) distinctive functions of geotextile. Provide a clear diagram to demonstrate the proper embedding of geotextile. (05 marks)