00261

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

Study Programme	: Bachelor of Technology Honours in Engineering
Name of the Examination	: Final Examination
Course Code and Title	**: CVX4446 Construction Engineering and Materials**
Academic Year	: 2020/2021
Date	: 09th February 2022
Time	: 09:30-12:30 hrs

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of Eight (8) questions in Four (4) pages.
3. This question paper has Two (2) sections, Section A & Section B
4. Answer a total of Five (5) questions selecting at least Two (2) questions from each section. All questions carry equal marks.
5. Answer for each question should commence from a new page.
6. This is a Closed Book Test (CBT).
7. Answers for sections A & B should be submitted on separate answer books with Section A and Section B written clearly on the cover of the respective book

SECTION A

(01)

(a). There are two (2) generally used systems of supplying water to buildings namely, (i) the direct system, and (ii) the indirect system. Explain these two different systems and emphasizing their usage. (04 marks)

(b). List & neatly sketch the main components of a water closet with flushing cistern. (04 marks)

(c). Describe with neat sketches the three (3) different ways in which the flushing cistern is connected to the water closet pan in the domestic usage. (04 marks)

(d). Explain the differences between 'friction piles' and 'end bearing piles' with respect to load transfer. (04 marks)

(e). Explain the differences between 'replacement piles' and 'displacement piles'. (04 marks)

(02)

(a). Explain the differences between 'rigid pavements' and 'flexible pavements' in highway construction. (04 marks)

(b). The wearing surface is the top surface of a road structure where wheels of passing vehicles come directly in contact with. A suitably constructed wearing surface is a prime requirement of a high-quality road. State four (4) reasons why a proper wearing surface is necessary for a road. (04 marks)

(c). Tar, Bitumen, and Asphalt are three terms often used in connection with wearing surfaces. Describe briefly these three types of material in relation to their basic properties. (04 marks)

(d). There are two types of wearing surface treatments: (i) seal coat, and (ii) tack coat. Explain the two types. (04 marks)

(e). Briefly explain why a proper drainage system is essential for the maintenance of a road. (04 marks)

(03)

Answer the following questions with illustrations where relevant:

(a) Briefly discuss four (4) important factors to be considered before commencing excavations adjacent to existing buildings. (04 marks)

(b) Give reasons for ventilating drains, and the methods of providing it. (04 marks)

(c) Describe the function and locating of manholes. (04 marks)

(d) Discuss selection of pipe gradient for a drainage system. (04 marks)

(e) The testing procedure of internal soil pipes. (04 marks)

(04)

'Strength' and 'durability' of hardened concrete are important factors that must be ensured during the construction stage.

(a) Briefly discuss four (4) factors which influence the strength of concrete. (04 marks)

(b) Discuss the function of water in a concrete mix, explaining its effects on the strength and durability of concrete. (04 marks)

(c) In construction of a high-rise building when ready mix concrete is to be used, state the details that should be considered and planned by the contractor to ensure correct pumping of concrete is done. (04 marks)

(d) Briefly describe the four (4) methods available for curing concrete in floor slabs. (04 marks)

(e) Briefly describe the difference between 'segregation' and 'bleeding' (04 marks)

SECTION B

(05)

A house construction is at its finishing stage. Plastering using cement mortar for external walls, lime/cement mortar for internal walls and painting with the emulsion paint have been selected for the finishes of internal and external walls.

(a) State four (4) functions of sand in a mortar mix. (02 marks)

(b) Magnesium lime is not considered suitable for plastering of walls.
   (i) Explain why it is not considered suitable for plastering of walls
   (ii) Describe a simple test that can be carried out to differentiate between magnesium lime from calcareous and hydraulic lime at the site. (05 marks)

(c) (i) Explain what blended cement is. (ii) State four (4) advantages of using blended cement instead of ordinary Portland cement for masonry work in external walls. (04 marks)

(d) It is important that we adhere to the specifications when choosing materials and methods for construction. Explain separately how the specifications for building works help the client and contractor. (04 marks)

(e) List the constituents in an emulsion paint and explain why each of these ingredients are essential for good quality paint. (05 marks)

(06)

Timber and timber-based products have been used as engineering materials from the olden times on account of the various advantages it possess over other materials and these need to be seasoned and preserved before being used.

(a) Give four (4) reasons why timber used for structural purposes should be properly seasoned and describe two methods of seasoning timber in green state before using for structural purposes. (04 marks)

(b) State four (4) factors that you would consider when selecting timber for (i) roof trusses (ii) marine work. (04 marks)

(c) Explain four (4) factors that affect the properties of timber. (04 marks)

(d) Write a short description of different types of defects in timber. Give four (4) reasons why defective timber is not suitable for making carpentry items. (04 marks)

(e) Distinguish between plywood and chip boards and give three advantages of each product. (04 marks)

(07)

A client of a tyre manufacturing factory has sought advice for building another factory at low cost in his premises to expand his manufacturing capacity.

(a) Discuss the alternative materials / methods that you would propose to bring down the cost of the roof (structure and covering) and ceiling. You may mention both the high cost and low-cost materials/methods. (04 marks)

(b) If cement blocks are recommended for walling material and be produced at the site itself, state the steps that you would take to ensure the production of good quality cement blocks. (04 marks)

(c) Propose two suitable low-cost flooring tiles for the factory floor and sanitary facility giving four (4) reasons for your choice. (04 marks)

(d) It is recommended that instead of timber, extruded aluminium windowsills be used to economise. Give (i) four (4) metallurgical treatments that can be used to improve the properties ofaluminium to suit the said application and (ii) four (4) advantages of usingaluminium instead of timber. (04 marks)

(e) Grills and railings to be manufactured using grey cast iron. Describe different forms of cast iron. (04 marks)

(08)

The new expressway from Colombo to Kandy is running through mountainous areas and needs stabilization of cut soil slopes.

(a) Explain how geosynthetic materials can be used to stabilise newly formed cut soil slopes. (04 marks)

(b) What are the specific properties a geotextile should possess when it is used for an application as above? (04 marks)

(c) Give four (4) advantages and disadvantages if coir geotextiles are used instead of polymeric geotextiles for the above application. (04 marks)

(d) List four (4) main polymer families most widely used for manufacturing geotextiles. (04 marks)

(e) Distinguish between geo grids and geonets giving an application of each. (04 marks)