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	**: CVX3530/CEX3230 Construction Materials**
Academic Year	: 2019/20
Date	: 09th October 2020
Time	: 1400-1700hrs
Duration	: **3 hours**

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **Eight (8)** questions in **Four (04)** pages.
3. Answer any **Five (5)** questions only. All questions carry equal marks. If you have answered more than five questions (either partly or in full), cross out the answers. Otherwise only the first five appearing in the answer book will be evaluated.
4. Answer for each question should commence from a new page.
5. Relevant charts/ codes are provided.
6. This is a Closed Book Test (CBT).
7. Answers should be in clear hand writing.
8. Do not use Red colour pen.

Question 01

Lintels and sunshades placed over doors and windows are formed with reinforced concrete made out of 1:2:4 (20mm) of Grade 20 with water/cement ratio of 0.45.

i. ***Describe*** how you would check the quality of cement brought to the site for adulteration.

(04 marks)

ii. ***Briefly explain*** the procedure of machine mixing of concrete.

(04 marks)

iii. ***Define*** the water/cement ratio. ***Explain*** the undesirable effects if a high water/cement ratio is used.

(04 marks)

iv. Three samples of concrete cubes were tested for compressive strength of the above mix using the mould size of 100 mm and failed at crushing loads of 245.65 kN, 252.90 kN and 250.55 kN. ***Calculate*** the compressive strengths of the each of the samples and estimate the Grade of the concrete mix.

(04 marks)

v. ***Explain*** what is meant by 'Blended Cements' and state four (04) advantages of blended cement over ordinary Portland cement.

(04 marks)

Question 02

It is necessary to build a warehouse for a garment factory. The walls are to be built using bricks and cement mortar and plastered using lime mortar.

i. ***State*** four (04) requirements/characteristics of good quality sand, and four (04) functions of sand in a mortar.

(04 marks)

ii. ***State*** the hardened state and fresh state properties of cement mortar.

(04 marks)

iii. According to SLS 552 specification ***what*** are the requirements related to quality expected of lime?

(04 marks)

iv. ***Explain*** how the lime is slaked using the platform slaking method.

(04 marks)

v. ***Describe*** how you would measure the quantities to prepare a mix of 1:5 cement mortar using gauge boxes.

(04 marks)

Question 03

Many wood-based products have been developed to economise on the use of timber. Plywood is one such product which is abundantly used in Sri Lanka to replace timber.

i. *State* four (04) structural applications of plywood.

(02 marks)

ii. *List* three (03) advantages and three (03) disadvantages of plywood.

(06 marks)

iii. *Write* a short account of defects in timber. *Explain* why defective timber is not suitable for making structural members.

(04 marks)

iv. *Explain* the four (04) factors that lead to decay of timber by fungi infestation and the measures that could be adopted to exclude each of these factors separately.

(04 marks)

v. *State* the criteria under which classification of timber is done in Sri Lanka.

(04 marks)

Question 04

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

i. *Briefly explain* the harmful ingredients in good brick earth, stating their effects on the properties of bricks.

(04 marks)

ii. *Describe* a simple test to determine efflorescence in bricks.

(04 marks)

iii. *State* the measures necessary to ensure manufacture of quality cement blocks.

(04 marks)

iv. Use of cement stabilised soil blocks is becoming popular nowadays due to the trend of green concept. *Explain* the role of cement in cement stabilised soil blocks.

(04 marks)

v. *Draw* a process flow chart for the manufacturing of lime stabilised soil blocks.

(04 marks)

Question 05

A hotel complex is to be extended by building up of a series of double storey cottages facing a coastal shoreline, and the construction work is at present in its finishing stage.

i. The staircase railings are to be made from *Mahogony* timber. ***Give*** suitable types of wood preservatives available to preserve *Mahogony* timber.

(04 marks)

ii. Grills and railings of the balcony are to be manufactured using wrought iron. ***Explain*** why wrought iron is suitable for this application.

(04 marks)

iii. ***Propose*** a suitable roofing material considering the location and state four (04) functional properties of the same.

(04 marks)

iv. Ceramic wall tiles are recommended for washrooms. ***Give*** four (04) physical properties of the tile that would be required.

(04 marks)

v. ***State*** two (02) common defects of ceramic wall tiles and ***describe*** how you would relate those to the manufacturing conditions.

(04 marks)

Question 06

The mechanical properties of pure aluminium and copper are not satisfactory for engineering applications. In order to improve the mechanical properties either alloying with other elements or performing metallurgical treatments are carried out.

i. ***State*** the properties of pure aluminum.

(04 marks)

ii. ***Identify*** the desirable engineering properties of aluminum obtained by alloying with the following:
   a) Silicon
   b) Magnesium

(04 marks)

iii. ***Describe*** the heat treatment process of Age hardening (Precipitation hardening) of aluminum.

(04 marks)

iv. ***State*** five (05) commercial Grades of copper.

(04 marks)

v. ***State*** four (04) advantages of copper alloys over pure copper.

(04 marks)

Question 07

Tar, Bitumen and Asphalts are a group of interrelated materials widely used in the field of civil engineering in damp proofing buildings, basements, roofs and constructing roads and highways.

i. ***Explain*** what Cut back bitumen is, ***classify*** its sub types and where these types are most suited.

(06 marks)

ii. ***Describe*** how bitumen and tars are heated.

(04 marks)

iii. ***Give*** four (04) functions of fillers in a bituminous mix.

(04 marks)

iv. ***State*** four (04) types of commonly used fillers in the industry.

(02 marks)

v. ***Discuss*** the significance of the standard penetration test conducted on bitumen.

(04 marks)

Question 08

Geosynthetics are materials used in civil engineering applications to perform various functions in earthworks such as reinforcement, separation, filtration etc.

i. ***Explain*** three (03) characteristics of geosynthetics that make them suitable in soil reinforcement applications.

(06 marks)

ii. ***List*** four (04) polymeric materials that are used in the manufacture of geosynthetics.

(02 marks)

iii. ***Give*** two (02) geotechnical applications where geosynthetics are used as the reinforcing material.

(04 marks)

iv. ***List*** six (06) different types of geosynthetics that are used in civil/geotechnical/ environmental applications.

(04 marks)

v. Coir geotextiles are now commonly being used in reinforcing applications. ***State*** six (06) distinctive advantages of coir geotextiles over polymeric geotextiles.

(04 marks)