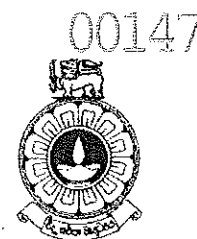


The Open University of Sri Lanka
Faculty of Engineering Technology
Department of Civil Engineering



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	: 2019/2020
Date	: 26 th July 2020
Time	: 0930-1230hrs

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. Answer a total of Five (5) questions selecting at least Two (2) questions from each section. All questions carry equal marks.
 4. Answer for each question should commence from a new page.
 5. This is a Closed Book Test (CBT).
 6. 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
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(01)

The quality of workmanship is very important to ensure the strength and durability of concrete. Answer the following in relation to the above statement.

- (a) Explain the difference between 'entrapped air' in concrete and 'entrained air' in a concrete mix. (05 marks)
- (b) Briefly discuss the three (3) main factors that affect the workability of concrete and their implication on ready-mix concrete. (05 marks)
- (c) Explain what is meant by 'curing' of the concrete cast at site, and the reasons why curing should be done. (05 marks)
- (d) Describe the procedure adopted to repair a honeycombed area on the side of a concrete beam. (05 marks)

(02)

- (a) What are the four (4) ways of applying energy in soil compaction? (04 marks)
- (b) Briefly describe the four (4) types of equipment used for soil compaction at site where above 4 ways of energy application is adopted. (04 marks)
- (c) Describe how you determine the production rate of soil compaction equipment by using a thumb rule that can be used to estimate the output of a compaction equipment. Explain all the factors involved, by using standard notations. (06 marks)
- (d) A layer of topsoil is to be moved over a haul distance of 30 meters with the help of a bulldozer under the following operating conditions:

The bulldozer travels at 3 km/h when it is pushing the topsoil and returns at double the pushing speed. The time taken for loading, shifting gears etc. is 0.35 minutes for each cycle. The operating factor is 50 minutes per hour. The soil has a swell of 25% and the rated capacity of the machine is 4 cubic meters of loose volume.

Determine the output of the bulldozer per hour. Indicate each step of your calculations. (06 marks)

(03)

- (a) Draw a typical characteristic curves for a centrifugal pump clearly indicating (i). Efficiency, (ii). Total head, and (iii). Break horse power. (04 marks)
- (b) Briefly explain the three (3) types of electrical wiring installations used in domestic buildings. (05 marks)
- (c) Briefly explain the following terms used in electrical installation systems;
(i) Earth (ii) Single-phase supply (iii) Three-phase supply (iv) Kilowatt (v) Rating (05 marks)
- (d) List the six (6) types of lamps commonly available. Briefly describe each of them. (06 marks)

(04)

- (a) As a responsible engineer the safety of people and property should be ensured when building in densely built-up areas.
- i. State six (6) important points to be considered in determining the type, and degree of support which should be provided to the sides of an excavation. (06 marks)
 - ii. Discuss two (2) important factors to be considered before commencing excavations adjacent to existing buildings. (05 marks)
- (b) Explain using clear and neat sketches, the use of a profile board to set out excavations for foundations of a new building. (04 marks)
- (c) Write short descriptive notes on “displacement piles” and methods of installing them. (05 marks)

SECTION B

(05)

Jack wood is brought to a construction site of a dwelling house to be used in rafters and other carpentry items such as doors, window frames, railings etc.

- (a) Explain how you would identify whether the Jack wood is suitable for the above-mentioned work. (04 marks)
- (b) Illustrate the different types of sawing methods practiced in the industry discussing the advantages and disadvantages of each method. (04 marks)
- (c) Discuss the various methods of preserving timber and state the most suitable method to be used for the rafters and carpentry items. (04 marks)
- (d) Explain in detail the various stages of painting new woodwork. (04 marks)
- (e) Use of plywood doors is a preferred option in place of timber doors. State the advantages and disadvantages of plywood. (04 marks)

(06)

A client of a garment factory has sought advice for building a new warehouse at low cost in his factory premises. A cement stabilized soil blocks for walls and a rubble foundation were suggested.

- (a) Explain the role of cement in manufacturing cement stabilised soil blocks. (04 marks)
- (b) Describe the manufacturing process of cement stabilised blocks. (04 marks)
- (c) State the physical properties that you would look for in selecting good quality stones and briefly describe the simple tests that can be carried out to assess the properties mentioned. (05 marks)

Use of polymer adhesives offers many advantages over other conventional binding techniques such as sewing, mechanical fastening, riveting etc.

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- (d) Explain what is meant by pressure sensitive adhesives, the polymers employed in manufacturing them and two (2) applications of the same. (04 marks)
- (e) Selecting the correct polymer adhesive for various material surfaces is important. Give suitable polymer coatings for the following material surfaces: (03 marks)
 - (i) Rubber to steel bonding
 - (ii) Rubber to fabric bonding
 - (iii) Metal to metal bonding

(07)

A hotel complex to be extended by building up of a series of a double storied cottages facing a shoreline is now at its finishing stage.

- (a) Balcony grills and railings are to be manufactured using cast iron. State (i) why cast iron is suitable for this application and (ii) corrosion preventive measures that you can adopt. (04 marks)
- (b) French polish is recommended for interior surfaces of all woodwork. Explain how the polish is prepared, and how the wooden surfaces are prepared to receive the polish. (04 marks)
- (c) Propose a suitable floor tile for the interior of the cottages and give four (4) physical properties of the tile that would be required. (04 marks)
- (d) A coloured clay roofing tile is recommended considering the aesthetic value of the cottage. State four (4) functional properties that should be satisfied by this roofing tile. (04 marks)
- (e) Walls are to be painted using emulsion paint. Give four (4) characteristics that this paint should possess. (04 marks)

(08)

Unreinforced unpaved roads are prone to rutting and 'mud- pumping' problem especially when the groundwater table is close to the sub – grade surface. Use of Geotextiles in these roads can eliminate this problem.

- (a) Using an illustration, explain the role of geotextile in stabilising the roads. (03 marks)
- (b) List the functions that need to be fulfilled by the geotextiles in the said application. (02 marks)
- (c) Geotextiles are made using one of the three traditional methods of producing textiles i.e weaving, knitting or nonwoven. Briefly explain these processes. (06 marks)
- (d) Give three (3) reasons for geosynthetics being widely used in place of many of the traditional materials in civil, geotechnical and environmental engineering applications. (03 marks)
- (e) Briefly explain the uses of natural biodegradable geotextiles. (06 marks)