00164

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	: 2017/18
Date	:17th January 2019
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 **Four (4)** 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 answers appearing in the answer book will be evaluated.
4. Answer for each question should commence from a new page.
5. This is a Closed Book Test (CBT).
7. Answers should be in clear hand writing.
8. Do not use Red colour pen.

Q1) Blended cements are now popular in the construction industry for both concrete and masonry work.

(i) What do you understand by the term 'blended cements'? State four (04) advantages of blended cement over ordinary Portland cement for masonry work.

(04 marks)

(ii) Explain the importance of having Sri Lanka Standards for cement and other construction materials.

(04 marks)

(iii) State the type of cement that you would recommend for the following applications giving reasons for your choice of material.

a. A thick concrete dam
b. A marine structure
c. For works in running water
d. For concrete structure exposed to soil and ground water with a high sulphate content

(04 marks)

(iv) Draw a line diagram describing the process of manufacturing cement.

(04 marks)

(v) Briefly describe how the initial and final setting times of cement are determined using Vicat's apparatus.

(04 marks)

Q2) Partition walls of a school building are to be constructed using bricks and lime mortar.

(i) Give the requirement of lime as per the SLS Standards.

(04 marks)

(ii) Explain how the lime is slaked using platform slaking. Give the chemical reaction pertaining to slaking of lime.

(03 marks)

(iii) If cement is used instead of lime for mortar, state the advantages and disadvantages of cement mortar over lime mortar.

(03 marks)

(iv) The bricks brought to the site are fond to be efflorescent. Explain what causes 'efflorescence in bricks' and the undesirable effects of using these bricks.

(04 marks)

(v) State the advantages and disadvantages of having cement stabilized blocks instead of bricks for partition walls.

(03 marks)

(vi) List three (03) common manufacturing defects present in bricks and explain how you would ascribe these to the manufacturing conditions.

(03 marks)

Q3) A cement concrete mix is to be made out of 1:2:4 (20mm) with water cement ratio of 0.5 for concreting of one kilometre length of a 3.70m wide road. The thickness of the concrete is 10cm.

(i) Estimate the quantities of materials assuming the following:
Density of cement – 1440kg/m^3
Density of fine aggregate – 1600kg/m^3
Density of coarse aggregate – 1350kg/m^3

(03 marks)

(ii) List four (04) requirements of good quality coarse aggregates that should be selected to prepare the above mix.

(04 marks)

(iii) State three (03) functions of fine aggregate in the above concrete mix.

(03 marks)

(iv) What do you understand by the term 'water cement ratio'? Describe the part played by the quantity and quality of water in the concrete.

(04 marks)

(v) Three samples of cubes of 100mm sides made with the above concrete mix failed at crushing loads of 245.5kN, 263.4kN and 258.6kN. Calculate the compressive strengths of the samples and make recommendations based on the average compressive strength.

(03 marks)

(vi) Describe how the slump test is carried out determine the workability of concrete.

(03 marks)

Q4) In modern building practice wood is extensively used for floor materials; carpentry items and roof materials.

(i) Explain as to why timber for the above applications needs to be properly seasoned and briefly describe the various methods of seasoning adopted in Sri Lanka.

(04 marks)

(ii) Explain why it is necessary to preserve timber and describe two (02) different techniques that are suitable to preserve timber to be used in making carpentry items such as doors, windows and frames.

(04 marks)

(iii) List the characteristics of good quality timber to be used as structural members in roofs.

(04 marks)

(iv) Discuss the advantages and disadvantages of timber doors over PVC doors for bathrooms.

(04 marks)

(v) List the factors on which classification of timber is done in Sri Lanka.

(04 marks)

Q5) Fibre glass is widely used in wall cladding.

(i) Explain why fibre glass is preferred to other material for the said application.

(03 marks)

(ii) List the main components of fibre glass production and discuss their functions.

(04 marks)

(iii) Discuss the merits and demerits of the production using low pressure technique and high pressure technique for manufacturing fibre glass.

(03 marks)

Use of polymer adhesives offers many advantages over binding techniques such as sewing, mechanical fastening, thermal bonding etc.

(iv) Give three (03) reasons as to why polymer adhesives are more advantageous than other binding techniques.

(03 marks)

(v) Explain what hot melt adhesives are and give two (02) applications of the same.

(03 marks)

(vi) Selecting the correct polymer adhesive for various material surfaces is important. Give suitable polymer adhesives for the following material surfaces:

Plywood
Concrete floors
Fibre reinforced plastic
Rubber to steel surfaces

(04 marks)

Q6) A government sponsored single storied low cost housing scheme is to be constructed in Nuwara Eliya with a road network.

(i) Give four (04) methods/ materials that could be utilised to bring down the cost of construction of houses.

(04 marks)

(ii) Propose a suitable type of roofing material for this scheme and state four (04) functional requirements that should be satisfied by the above roofing material.

(04 marks)

(iii) Ceramic tiles are to be used for the veranda of the houses; state two (02) common manufacturing defects present in ceramic tiles and explain how you would ascribe these to the manufacturing conditions.

(04 marks)

(iv) Suppose the road construction is going to be carried out in drier period of the year and the daily temperature fluctuation is within 15°C to 20°C. Propose the most suitable type of binder to be used in the construction of the road network justifying the suitability; of the selection.

(04 marks)

(v) Describe how you would supervise heating of these binders.

(04 marks)

Q7) Ferrous and nonferrous metals and alloys are widely used in the construction industry.

(i) State the difference between mild steel, wrought iron and cast iron.

(03 marks)

(ii) Describe briefly the corrosion of steel and measures adopted for its prevention.

(03 marks)

(iii) Steel is subjected to heat treatment so as to develop specific properties; state four (04) different methods of heat treatment.

(02 marks)

(iv) Give four (04) reasons for using copper in its unalloyed form.

(02 marks)

(v) Aluminium alloys are now extensively used as corrugated roofing sheets. Discuss the advantages and disadvantages of this material over tile roofing.

(04 marks)

(vi) Identify the desirable engineering properties of Aluminium obtained by alloying with the following:

(a) Silicon
(b) Manganese
(c) Copper

(06 marks)

Q8) A newly formed cut slope in a mountainous region of a road needs to be stabilized.

(i) Describe how geosynthetics could be used to stabilize and reduce erosion of slopes.

(04 marks)

(ii) State the properties of geosynthetics that make them suitable for the above application.

(04 marks)

(iii) Explain the utilization of geosynthetic material in retaining wall construction with the aid of a neat diagram.

(04 marks)

(iv) List the functions that need to be fulfilled by the geosynthetics in a retaining wall construction.

(04 marks)

(v) Give four (04) applications of natural biodegradable geotextiles.

(04 marks)