THE OPEN UNIVERSITY OF SRI LANKA
Diploma In Technology (Civil) - Level 3
CEX 3230 /CED 1204 – Construction Materials

125

FINAL EXAMINATION - 2006 / 07

Time Allowed : Three Hours **Index No. .....**

Date: 2007 - 03 - 16 (Friday) Time: 0930 - 1230 hrs.

The paper consists of two sections, Part A and Part B.
Please detach Part A and submit with your answer script at the end of the examination.

Part A
Part A consists of fourteen (14) questions.
Answer All Questions in the spaces provided.
(You are advised to allocate 50 minutes for Part A)

1. Give a type of cement that you would recommend to be used in the construction of a concrete dam and give explanation for your recommendation. (2 points)

2. It is very important to have specifications in construction work. Explain Why. (2 points)

3. The raw PVC resin cannot be processed and put to final application without the use of additives. Plasticisers are the most important group of additives. Explain the function of plasticisers in the production of PVC. (2 points)

4. You are required to select suitable stones for building a rubble retaining wall. Describe a simple test to check whether the stones are of sufficient durability for the given application. (2 points)

5. Alloys of copper and Tin are referred to as bronzes. Give one application of Bronze and give three reasons for the selection of Bronze for the application stated. (2 points)

6. Fibreglass nowadays finds a wide range of applications in various industrial fields. Give one application of fiberglass and three reasons for the selection of fiberglass for the application stated. (2 points)

7. Crazing and pin holing are two commonest defects present in wall tiles. Explain how you would ascribe these to the manufacturing conditions. (2 points)

PQ498

8. Suitable flooring tiles are required to be chosen for a warehouse. State four physical properties, which would be required. (2 points)

9. Using Vicat's apparatus the initial setting time of Portland cement was measured as 100 minutes. Explain why this has to be adequately large with respect to construction of a concrete slab. (2 points)

10. Lead and its alloys possess certain properties that make them effective in the construction industry. Give two applications of Lead alloys and the property identified in selecting each. (2 points)

11. Although wrought iron is considered a less important material for structural purposes, it is largely used for fabricating ornamental ironwork. State four desirable properties of wrought iron, which make it suitable for such application. (2 points)

12. The following results have been obtained when testing the water absorption rate of bricks.

    Mass of the dry brick = 1820 g

    Mass of the brick after 24 hours immersion in cold water = 2010g

    Compute the percentage of water absorption of the bricks. (2 points)

13. Pressure sensitive adhesives are thermoplastic or electromeric character. Give three applications where pressure sensisitive adhesive is used. (2 points)

14. Give an advantage and a disadvantage in using hollow cement blocks as a walling material for a film hall theatre. (2 points)

3

paper consists of Seven (7) Questions.

wer Four (4) Questions.

A single storey building for a shopping complex is to be built. The design shows that this needs to be roofed over by reinforced concrete beams and slabs. Assume that you have been appointed as the Technical officer to the said project and answer the following questions.

i. Explain four steps you will take to ensure the quality of cement. (4 points)

ii. Discuss the effects of compaction and curing on the strength of concrete. (4 points)

iii. Explain how the moisture content of fine aggregates at site affects the water cement ratio specified. (4 points)

iv. Discuss the importance of grading of aggregates when the aggregates are used to produce concrete. (4points)

v. State four types of steel reinforcement that could be used in reinforcing the concrete beam and slabs. (2 points)

2. Mortar is a paste formed by mixing water, fine aggregate and a binding material in a specified proportion to bind bricks, stones or concrete blocks together.

i. Give three functions of fine aggregate in a mortar mix. (4 points)

ii. Describe three simple field tests to assess the suitability of water in a stream / river to be used in mortar for construction. (3 points)

iii. Give four requirements of good building mortar. (4 points)

iv. State three disadvantages of lime mortar over cement mortar for external walls. (3 points)

v. Magnesium lime is considered not suitable for plastering of walls. How will you differentiate magnesium lime from calcareous lime for plastering of walls? (4 points)

Q3.

Timber is extensively used in civil engineering construction and needs to be well seasoned to be used as structural elements.

i. Explain why timber used for structural purposes should be properly seasoned. Give two reasons. (3 points)

ii. Describe two methods for seasoning of timber from green state in Sri Lanka before using for structural purposes. (3 points)

iii. List four characteristics of good quality timber for structural purposes. State the defects that may be present. (4 points)

iv. Explain how seasoned timber is painted. Give the various operations involved in detail and why those operations are performed. (5 points)

v. State four reasons why chipboards cannot be used as structural timber. (3 points)

Q4.

i. The mechanical properties of Aluminium are not satisfactory for engineering applications and various metallurgical treatments are adopted to improve the properties.

a. Briefly describe two common metallurgical treatments performed in the industry in order to increase the properties. (5 points)

b. Various Alluminium alloys find application in the construction industry. Copper is one of the most common alloyed elements to Aluminium. State four properties of Al – Cu alloys. (4 points)

ii. The ferrous metal iron is the most important metal used in engineering construction.

a. Explain the process of obtaining steel from iron – ore. (3 points)

b. State three examples of uses of plain carbon steel in the industry. Of those you mentioned, select one product and identify the properties of plain carbon steel, which made it suitable for the manufacturing of the identified product. (3 points)

c. Describe how the varying percentage of carbon affects the properties of plain carbon steels. (3 points)

Q5.

i. Paints are required mainly to protect metal work, timberwork and walls as well as for decorative effect.

a. Describe three characteristics of a good paint. (3 points)

b. State the various types of failures commonly observed in paintwork and how these are prevented. (3 points)

c. Describe the preparatory work done before repainting (6 points)

An old wooden window sash

An old iron railing

ii. Bitumen and coal tar are the two basic materials used in roadwork as binding materials.

a. Compare four characteristics of coal tar and bitumen. (2 points)
b. Standard penetration test is used to measure the consistency of bitumen. Discuss the importance of these test results in selecting bitumen for various applications. (4 points)

Q6. The use of concrete tiles, which use coconut fibres are still at the development stage and can be used as a device to cut down the cost of a building a house as the cost of this tile is generally lower than that of any tile.

i. State four measures necessary to ensure quality in the manufacture of concrete roofing tiles. (4.5 points)
ii. List three drawbacks of concrete roofing tiles. (3 points)
iii. Describe other low cost materials / methods to bring down the cost of a building a house. You may have to state low cost materials / methods in place of high cost materials / methods. (4.5 points)
iv. State the advantages of using asbestos roofing sheets over concrete roofing tiles. (3 points)
v. List three common defects noticeable in fired clay roofing tiles. (3 points)

Q7. Synthetic geotextiles placed at the sub grade and base layer interface of unpaved roads provide a solution for rutting and mud pumping as these provide separation, reinforcement, filtration and drainage.

i. Describe briefly what a geotextile is. (3 points)
ii. Sketch a diagram of a road constructed with geotextiles at the sub grade interface and show how this acts as a separator. (5 points)
iii. Give two other areas where geotextiles find applications as a separator. (3 points)
iv. State three reasons for geosynthetics being widely used as against many of the traditional materials in civil engineering applications. (5 points)
v. List four biodegradable geotextiles in civil engineering applications. (2 points)