

THE OPEN UNIVERSITY OF SRI LANKA

DIPLOMA IN TECHNOLOGY (ENGINEERING) - LEVEL 3

FINAL EXAMINATION - 2013/14

CEX3230 - CONSTRUCTION MATERIALS



Time allowed: Three hours

Date: Tuesday, 05th August 2014

Time: 0930 -1230 hours

Answer any five questions. All questions carry equal marks.

If you have answered more than five questions (either partly or in full), cross out the extra answers. Otherwise, only the first five answers appearing in the answer book will be evaluated.

- Q1. A concrete slab for placing a overhead PVC water tank is made of a mix proportion 1:2:4 (20mm), grade 25 reinforced concrete with 0.4 water cement ratio.
- Explain the specified concrete mix to be used for concreting the slab. (3 marks)
 - Identify the specific use of each constituent of the concrete mix. (3 marks)
 - State the undesirable effects of high water cement ratio. (3 marks)
 - Discuss the advantages of using a PVC water tank over a concrete water tank. (3marks)
 - If the cement bought are suspected to be adulterated, state the steps that you would take to ensure its quality. (3 marks)
 - What is meant by workability of concrete? Describe how workability is measured using the slump test. (5 marks)
- Q2. The most common building materials used for fabricating roof trusses are structural steel sections and seasoned timber.
- Explain why timber for structural purposes should be properly seasoned. Describe two methods used in Sri Lanka for seasoning of timber from green state before using for structural purposes. (3 marks)
 - In recent times the use of steel sections for structural work has superseded timber. Explain why. (3 marks)
 - Describe the process of painting steel trusses to protect from corrosion indicating suitable types of paints. (3 marks)

- iv. List three properties of good quality timber for structural purposes. Explain as to why plywood is not an alternative for this purpose. (3 marks)
- v. Write a short account on defects of timber and explain why timbers with defects are not suitable to be used in structural use. (5 marks)

Q3. Answer the following questions in relation to stones, bricks and blocks which are used in various applications such as load and non load bearing walls, foundations, retaining walls, floors etc.

- i. State the requirements of a stone that you would recommend for use in an earth retaining wall. (3 marks)
- ii. How would you test the requirements mentioned above? (4 marks)
- iii. Efflorescence is an undesirable effect in brick walls. What is "efflorescence" and what are its undesirable effects? (3 marks)
- iv. Describe a test to find out the water absorption of bricks. Why is it not suitable to have a high water absorption rate of bricks? (4 marks)
- v. State the relative merits and demerits of soil stabilized blocks over cement concrete blocks for load bearing walls. (3 marks)
- vi. What underlying reasons govern the selection of a walling material for a film hall theatre? (3 marks)

Q4. For a low cost housing scheme lime mortar was chosen for internal and external finishes and concrete roofing sheets with incorporating coconut fibres (FCR tiles) tiles as a roofing material.

- i. Sri Lanka Standard Institution specifies SLS 502 for Lime. Do you consider specifying a standard for Lime is a good practice? If so explain why? (3 marks)
- ii. Distinguish between fat lime and hydraulic lime with respect to their chemical composition, slaking and usage. (5 marks)
- iii. Explain how you would supervise mixing of lime mortar for plastering. (3 marks)
- iv. Give three functions of sand in lime mortar. (3 marks)
- v. Discuss the merits and demerits of FCR tiles over asbestos roofing sheets. (3 marks)
- vii. List out the properties that FCR tiles should have to function as a roofing material. (3 marks)

- Q5. (a) Copper is an important engineering material and is widely used in unalloyed condition as well as combined with other metal in the alloyed form in many applications in building construction.
- List the commercial grades of pure Copper. (3 marks)
 - Copper alloys when compared to pure Copper possess some advantages. List those advantages. (3 marks)
 - Give four important alloying elements used to produce Copper based alloys. (3 marks)
- (b) Cast iron is widely used in engineering and allied industries. Irrigation sluice gates, penstocks, grills, ornamental work, manhole covers are a few items that are made out of cast iron.
- List different types of cast iron and describe their chemical composition. (5 marks)
 - State four desirable properties of cast iron to manufacture grills. (3 marks)
 - Explain why pure Aluminium is not suitable for the above application. (3 marks)
6. (a) Paint and varnishes are used to protect metals, timber or plastered surfaces from corrosive effects of weather, heat moisture and also to improve their appearance.
- What are the characteristics of a good paint? (3 marks)
 - How do you prepare the French polish? (3 marks)
 - Explain in detail the various operations involved in painting a new door. (5 marks)
- (b) Two refined types of bitumen are 'straight run bitumen' and 'blown bitumen'.
- Explain how these two bitumen types are produced. (3 marks)
 - Suitability of bitumen is tested using Standard Penetrometer apparatus by measuring a standard penetration. What is standard penetration? What does a high penetration number indicate? (3 marks)
 - Describe how you would supervise heating of bitumen to be applied for road surfaces. (3 marks)

7. (a) Fibre glass pipes are used in above and below ground level systems including drinking water, wastewater, natural gas etc.
- Explain why fibre glass is preferred to other materials for drainage pipes. (3 marks)
 - Give basic raw materials for fibre glass production. (3 marks)
 - In what respect does fibre glass differ from metal? (3 marks)
- (b) Bitumen and coal tar are the two basic materials used in road works as binding materials.
- What is the role of polymer coatings in wooden surfaces? (3 marks)
 - Give a suitable primer and a suitable finishing coat to be applied to structural steel. (3 marks)
 - Compare and contrast the properties of thermosetting and hot melt adhesives. (5 marks)
- Q8. Heavy precipitation on slopes may erode surface soils, especially slopes with fine grained soils. Geosynthetic erosion control mats are commonly used to address difficult erosion prone slope conditions.
- Explain how geosynthetics could be used on slopes to control erosion. (4 marks)
 - List out the various uses of geotextiles in subsoil drainage to safeguard against erosion. (4 marks)
 - List out the materials that are used to manufacture geotextiles. (4 marks)
 - Give advantages of coir geotextiles in erosion control applications. (4 marks)
 - Discuss the advantages of using biodegradable geotextiles over synthetic geotextiles for erosion control applications. (4 marks)