00268

THE OPEN UNIVERSITY OF SRI LANKA
Bachelor of Technology - Level 3
CEX 3230 - Construction Materials
Final Examination - 2015/2016
Time Allowed 3 hours

Date: 17th November 2016 Time 9.30 a.m. - 12.30 p.m.

Answer **any five** questions. All questions carry equal marks. Write down your Index Number clearly on the answer script.

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 PVC water tank is made of a mixture of cement, sand and metal in proportion of 1:1.5:3 together with a water cement ratio of 0.4. It is reinforced with mild steel bars and wet concrete is compacted well to form a reinforced concrete slab.

(i) Identify specific uses of each constituent. (5 marks)

(ii) State three undesirable effects of having high water content. (3 marks)

(iii) Explain the necessity for reinforcing and compacting the concrete slab. (3 marks)

(iv) State three hardened state properties of structural concrete. (3 marks)

(v) A concrete cube of the above mix with 100mm sides failed at a crushing load of 250kN. Calculate the compressive strength of concrete in MPa. (3 marks)

(vi) Explain two main reasons for giving specifications for building works. (3 marks)

Q2. A retaining wall using random rubble masonry is to be built in order to stabilize a soil slope.

(i) State four properties that you would look for in a good building stone for the above purpose. (4 marks)

(ii) Describe briefly the tests that you would conduct to assure the quality of the stone. (4 marks)

(iii) Would you recommend lime mortar for masonry work in the wall? Give reasons for your answer. (4 marks)

(iv) State four properties of sand that should be used to produce strong mortar. (4 marks)

(v) Explain how lime putty is made in the local industry. (4 marks)

Q3. Cement stabilized blocks, cement concrete blocks and bricks are used as walling material in Sri Lanka for building construction.

(i) Draw a process flow chart to illustrate the manufacturing process of cement stabilized blocks. (4 marks)

(ii) Discuss three relative merits and demerits of cement stabilized blocks over cement concrete blocks. (4 marks)

(iii) Discuss three relative merits and demerits of solid concrete blocks over hollow concrete blocks. (4 marks)

(iv) Describe four common defects in clay bricks. (4 marks)

(v) What is 'efflorescence in bricks'? State the undesirable effects of using such bricks in construction. (4 marks)

Q4. Mahogony wood was brought to a construction site to make doors, windows and frames.

(i) List the basic steps that would transform Mahogony logs to painted timber doors. (4 marks)

(ii) Varnish is the most commonly used natural finish for exterior timber. Describe the procedure for varnishing the windows and frames. (4 marks)

(iii) State the advantages and disadvantages of having plywood doors instead of mahogany doors. (4 marks)

(iv) It was found that the timber was not seasoned adequately. State the undesirable effects of using unseasoned timber for doors, windows and frames. (4 marks)

(v) If timber was found to be infested explain how you would remedy it. (4 marks)

Q5. A building for a factory with a steel roof truss with asbestos roofing is to be built close to the sea.

(i) Discuss the advantages and disadvantages of steel over timber for the roof truss. (4 marks)

(ii) Describe two different methods of enhancing corrosion resistance of a steel truss. (4 marks)

(iii) Explain the process of obtaining steel from iron-ore. (4 marks)

(iv) State four precautions that need to be exercised when working with asbestos sheets. (4 marks)

(v) Give reasons why asbestos is preferred over clay tiles. (4 marks)

Q6. An old hospital building is to be refurbished. The cement rendered floor is to be tiled using suitable floor tiles. The upper part of the white washed walls is to be painted with emulsion paint and the lower half of the wall is to be tiled. The existing access road of the hospital is proposed to be tarred using bitumen cutback.

(i) Propose a suitable tile for the floor and the reasons for choosing the said tile. (4 marks)

(ii) State four characteristics that the emulsion paint should have. (4 marks)

(iii) List out two purposes of having a prime coat for painting plastered surfaces. (4 marks)

(iv) If the wall tile is ceramic, state the common defects of these and how you would ascribe this to manufacturing conditions. (4 marks)

(v) What is bitumen cut back? State two advantages. (4 marks)

Q7. (a) Fibre glass finds its applications in roof sheets, wall cladding and drainage pipes.

(i) State the basic raw materials required for the production of fibre glass. (3 marks)

(ii) What are the advantages and disadvantages of the low pressure technique for the production of fibreglass? (4 marks)

(iii) Explain why fibreglass is preferred to metallic drainage pipes. (3 marks)

(b) Ferrous and non- ferrous metals and their alloys are widely used in the construction industry.

(i) List down the properties of gray cast iron. (3 marks)

(ii) Give reasons for using Copper in unalloyed form. (3 marks)

(iii) Draw typical stress - strain curves for mild steel and copper with the same set of axes and indicate the important points. (4 marks)

Q8. A highway is proposed to be constructed from Colombo to Kandy running through hilly areas. Geotextiles and geogrids can be used to reinforce soil mass and is preferred over the conventional gravity or cantilever walls.

(i) Explain why geotextiles are preferred over traditional methods of stabilizing slopes. (5 marks)

(ii) Describe how geotextiles can be used to stabilize cut slopes. (4 marks)

(iii) List out the materials that are used to manufacture geotextiles. (4 marks)

(iv) Explain why biodegradable geotextiles are preferred over synthetic geotextiles. (4 marks)

(v) Give three types of biodegradable geotextiles. (3 marks)