THE OPEN UNIVERSITY OF SRI LANKA
DIPLOMA IN TECHNOLOGY (CIVIL) - LEVEL 4
FINAL EXAMINATION - 2013/14

CEX4232 - CONSTRUCTION ENGINEERING AND PLANNING

Time allowed : Three hours

Date : Wednesday, 13th August 2014 **Time : 09:30 - 12:30**

Selecting at least two (2) questions from each section, answer a total of five (5) questions. All questions carry equal marks.

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.

Write down your Index Number clearly on both answer books.

SECTION A

(01)

(a). Explain the difference between 'rigid pavements' and 'flexible pavements' in highway construction. (04 marks)

(b). The wearing surface is the top surface of a road structure where wheels of passing vehicles come directly in contact with. A suitably constructed wearing surface is a prime requirement of a high quality road. State five (5) reasons why a proper wearing surface is necessary for a road. (04 marks)

(c). Tar, Bitumen, and Asphalt are three terms often used in connection with wearing surfaces. Describe briefly these three types of material in relation to their basic properties. (04 marks)

(d). There are two types of road surface treatments; (a) seal coat, and (b) tack coat. Explain the two types. (04 marks)

(e). Briefly explain why a proper drainage system is essential for the maintenance of a road. (04 marks)

(02)

(a). Explain what is meant by 'curing' of concrete cast at site, and why it is done. (04 marks)

(b). Explain how the admixtures influence the 'workability' of freshly mixed concrete. (04 marks)

(c). Explain the terms "entrapped air" in concrete and "entrained air" in a concrete mix. (04 marks)

(d). Briefly describe the procedure adopted to repair a honeycombed area on the side of a concrete beam. (04 marks)

(e). Describe the causes for "shrinkage" of concrete. (04 marks)

(03)

(a). Determine the output of a bulldozer in an earth moving operation where a topsoil layer has to be moved over a haul distance of 50 meters with the help of a bulldozer under the following operating conditions.

The bulldozer travels at 2.5 km/h when it is pushing the topsoil and returns at 5 km/h. The time taken for loading, shifting gears etc. is 0.4 minutes for each cycle. The operating factor is 45 minutes per hour. The soil has a swell of 20% and the rated capacity of the machine is 3 cubic meters of loose volume. Compute the output of the bulldozer per hour indicating the necessary steps.

(05 marks)

(b). Explain what is meant by 'soil compaction'. (05 marks)

(c). Briefly describe the procedure for compacting earth works. (05 marks)

(d). What are the methods available to specify soil compaction to the contractors? (05 marks)

(04)

(a). There are two generally used systems of supplying water to buildings namely (i) the direct system, and (ii) the indirect system. Explain these two different systems and discus their usage. You may support your answer with illustrations. (04 marks)

(b). List & neatly sketch the main components of a water closet & flushing cistern. (04 marks)

(c). Describe with neat sketches the <u>three</u> (3) different ways in which the flushing cistern is connected to the water closet pan in the domestic usage. (04 marks)

(d). Explain the differences between 'friction piles' and 'end bearing piles' with respect to load transfer. (04 marks)

(e). Explain the differences between 'replacement piles' and 'displacement piles'. (04 marks)

SECTION B

(05)

You are appointed as the Assistant Engineer of the main contractor for a high-rise building construction project. Answer the following with reference to this project.

(a) Draw a complete Site Staff organization chart for the main contractor and indicate your position clearly on it (05 marks)

(b) Name five types of equipment/machinery that need to be provided specifically on a high-rise building construction site and explain their use (05 marks)

(c) Name five site facilities commonly provided on a high-rise building construction site. How will the work progress suffer if these are not provided at their best? (05 marks)

(d) Explain how you will measure the progress of the construction work. Use relevant diagrams as required (05 marks)

(06)

A small two span bridge is to be constructed. One span is of in situ reinforced concrete, while the other span is of pre cast concrete. The construction activities for the East, West and Centre positions are to be carried out as given in the table below.

Activity No.	Description	Duration (days)	Preceding activity
1	Pile & cap- East	10	-
2	Pile & cap- West	8	-
3	Pile & cap- Centre	5	-
4	Substructure- East	23	1
5	Substructure- West	20	2
6	Substructure- Centre	17	3
7	Construct in-situ span	30	4,6
8	Construct pre-cast span	5	5,6
9	Surfacing of bridge deck	5	7,8
10	Finishes	14	9

(a) Draw a detailed activity-on-arrow diagram for the project (04 marks)

(b) Indicate the critical path, earliest start time & finish time and the latest start time & finish time for each activity (04 marks)

(c) Draw a bar chart based on the earliest start times (04 marks)

(d) Identify the activities for which the services of a crane are required and discuss how the activities can be staggered if only one crane is available. (08 marks)

(07)

It is required to 'plan' and 'construct' water supply projects in rural areas of Sri Lanka.

(a) Outline the Macro level planning required for this project indicating who are responsible & the broad items of work involved (05 marks)

(b) Outline the steps of a 'Total Construction Planning Process' (07 marks)

(c) Consider the construction of one rural water supply project. Prepare a list of macro level activities. (04 marks)

(d) Identify the micro level activities for two (2) of the macro level activities you have listed in (c) above. (04 marks)

(08)

Write short descriptive notes on the following.

(a) Factors that will increase the production rate of earthmoving operations (05 marks)

(b) The types of costs involved in the building up of a Tender Price for a construction project (05 marks)

(c) Accident prevention measures that can be taken at the planning stage of a construction project (05 marks)

(d) The important elements of a Cost Data Bank. (05 marks)