THE OPEN UNIVERSITY OF SRI LANKA
DIPLOMA IN TECHNOLOGY (CIVIL) - LEVEL 4
FINAL EXAMINATION - 2006/2007

CEX 4232 - CONSTRUCTION ENGINEERING AND PLANNING

Time allowed : Three hours

Date : Tuesday, 13th March 2007 **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 sheets with section A and Section B written respectively on the answer scripts.

Write down your Index Number clearly on both answer scripts.

SECTION A

(01)

The quality of workmanship is very important to ensure the strength and durability of concrete. Discuss the following in relation to this.

(a). "Entrapped air" in concrete and "entrained air" in a concrete mix. (5 marks)

(b). Briefly describe the three (3) main factors that affect the workability of concrete and its implication for ready-mix concrete. (5 marks)

(c). The method of using a poker vibrator for the compaction of concrete and suitable precautions to be taken. (5 marks)

(d). Explain what is meant by 'curing' of the concrete cast at site and the reasons why it should be done. (5 marks)

(02)

(a) Write down three (3) practical applications of reciprocating pumps. (5 marks)

(b) Describe the two (2) basic types of poker vibrators explaining the difference of their vibratory functions. (5 marks)

(c) Name and describe the two (2) types of pile driving rigs highlighting their differences. (5 marks)

(d) List the five (5) types of pile driving hammers that work on pounding principle. (5 marks)

(03)

(a) Traps play an important part in internal plumbing. Explain the different types of traps used in internal plumbing with the help of neat sketches indicating the 'seal depth' in each case. (5 marks)

(b) What are the three different ways the water from traps is lost? Sketch how the siphonage occurs and state the causes for these effects. (5 marks)

(c) Sketch the timber shuttering for a column and briefly describe how it is installed. (5 marks)

(d) Briefly discuss <u>five</u> (5) important factors to be considered before commencing excavations very close to existing buildings. (5 marks)

(04)

(a) Explain the following terms connected with a road structure; discuss their form and functions.

(i). Formation (Sub grade) (ii). Sub base

(iii). Base (iv). Wearing surface (5 marks)

(b) What are the main reasons for surfacing a road? (5 marks)

(c) Describe the difference of "rigid" and "flexible" highway pavements. (5 marks)

(d) Explain what a surface dressing means. Explain in detail how a Single Base Surface Dressing (SBST) and a Double Base Surface Dressing (DBST) is carried out. (5 marks)

SECTION B

(05)

Ministry of Higher Education wants to establish its seventh Medical Faculty with foreign assistance in Anuradhapura affiliated to the Rajarata University. This project is to include residential facilities, sports complexes, internal road network etc. in addition to the primarily required state of the art buildings for student education. In essence this will be made the most resourceful of all the Medical Faculties and commissioning is to be done with immediate effect. After contract documents were finalised, tenders were called, evaluated and the contract was awarded to a leading contractor. The total cost of the proposed medical faculty is Rs.2, 000 million. The scheduled duration of the project is two years. The contractor is aware of the importance of 'planning' in this project because of high project cost and the comparatively short duration available to finish the project.

(a) Explain what is understood by;

Macro level planning
Micro level planning

(Marks 04)

(b) Explain the significance of 'planning' for a project of above nature. (Marks 04)

(c) Prepare a comprehensive list of activities that results from the macro level planning exercise carried out for this project. Also explain how you would carry out the micro level planning for this project. (Marks 06)

(d) Explain how you can use bar charts for the Micro level planning while emphasizing on the benefits it provides. (Marks 06)

(06)

(a) Explain how tender price of an activity is computed. (Marks 04)

(b) Briefly explain the following estimating methods
Unit rate estimating
Operational estimating

(Marks 06)

(c) ABC piling, a reputed pile construction firm wants to know the profitability of concreting operation in its recently undertaken piling project. The plant and labour requirement for the concreting operation is as shown in the table next page;

Item	Number	Cost per day Rs.
Plant		
Mixer	02	1750
Dumper	03	850
Winch	03	700
Bowser	01	1500
Tremie pipes set	01	775
Cutter (600mm)	01	800
Casings set	01	1200
Labour		
Mason	03	600
Foreman	02	700
Machine operator	03	550
Unskilled Labour	08	400

Assumptions

The number of piles driven per day is two
All piles have a common diameter of 600mm
All piles have an approximate depth of 11m from the ground level.

The material requirement and their respective costs are as given below;

The reinforcement cage for each pile has 6 Nos., 16mm bars. The height of the cage is 11m and a lap length of 1 m is provided for each bar. The cost of each bar is Rs.625. The concrete is supplied by a ready mixed concrete supplier at a rate of Rs.7, 500 per cum.

Determine the total cost of installing a pile after determining the labour, material and plant costs separately. Name the estimating method adopted in the computation.

(Marks 10)

(07)

(a) Describe the types of maintenance in relation to construction plant and equipment. (Marks 10)

(b) Explain the importance of first aid in common injuries. (Marks 05)

(c) Describe the types of wounds caused in a construction site. (Marks 05)

(08)

The following table gives a set of activities taken from a project associated with the construction of a factory building. The precedence and duration of each activity are also given in the table.

Activity	Description	Preceding activity	Duration (weeks)
A	Materials delivery	-	3
B	Excavation	-	2
C	Draining work	-	2
D	Gardening work	-	6
E	Electrical work	A	3
F	Doors and windows	A	3
G	Roof fabrication	A	4
H	Foundation	B	5
I	Wall fabrication	A	6
J	Erection	I, H and C	5
K	Plumbing work	G, I, H and C	2
L	Install fence	D	2
M	Painting	F and J	2
N	Finishing	E, M and K	2

(a) Draw an activity on arrow network diagram and mark the critical path.

(Marks 10)

(b) Find out the total float, free float and independent float for activities C and G.

(Marks 05)

(c) Explain how you can use Critical Path Method (CPM) as a project monitoring and controlling technique and the benefits of using it.

(Marks 05)