THE OPEN UNIVERSITY OF SRI LANKA
Department Of Civil Engineering
Post Graduate Diploma in Technology - Construction Management - Level 7

CEX7107/CEP2107/CEE7107 – Construction Productivity & Quantitative Techniques

FINAL EXAMINATION - 2005

Time Allowed: Three Hours

Date: 2006 - 03 - 24	Time: 0930 - 1230 hrs

Answer Four (04) questions with Two (02) from each section.

SECTION A - CONSTRUCTION PRODUCTIVITY
Q1.

i.) Productivity in a construction project is influenced by two major aspects. These aspects are **Technical** and **Social**. Identify and describe *five (05)* of the most prominent factors under either of above aspects, relevant to Sri Lankan construction industry.

(06 marks)

ii.) Method Study, or in other words evaluation of the process of an operation can be greatly assisted by **Multiple Activity Charts**. Describe the advantages of Multiple Activity Charts in such applications using an example of your choise.

(06 marks)

iii.) To objectively evaluate the productivity of personnel, a datum productivity termed the **'Standard Performance'** is ascertained. Define and describe this Standard Performance.

(06 marks)

iv.) A condominium project in the heart of Colombo city involves construction of several ten-storey building blocks. The construction operations involve extensive concrete placing above ground for floor slabs and the framed reinforced concrete structure. Premix concrete delivered to the site by trucks is conveyed by dumpers to tower crane where hoisting is done by skip. A work crew engaged in this operation produced irregular performance with production targets falling short of the stipulated. After making realistic assumptions on the site layout, equipment usage and labour assigned to this operation, outline a procedure, which the site Engineer could adopt in order to understand the source of the problem and develop solutions to improve the situation.

(07 marks)

Q2.

i.) Clearly describe and differentiate between **Remuneration** and **Incentives**.

(06 marks)

ii.) Incentives are considered to have catalytic effect on the productivity of operations involving human labour. Discuss with examples, the *three (03)* broad areas into which incentives can be categorized.

(06 marks)

iii.) Indicate the advantages and disadvantages of following *three (03)* financial incentive schemes with reference to **road construction** work;
a.) Piecework schemes   b.) Hours saved schemes   c.) Group schemes

(06 marks)

iv.) When attending a meeting several important items should be clarified in the mind of a Project Manager, so as to turn the meeting to his advantage and improve the productivity and expedite project targets. Identify and describe these items.

(07 marks)

Q3.

i.) Describe the method of **activity sampling** and clearly enumerate the advantages of this method over other alternatives for time study.

(06 marks)

ii.) The process of negotiation is an important part of construction management. Define the term **"negotiation"** and explain its importance. Prepare a of list guidelines for the process to be effective.

(06 marks)

iii.) **"Time Robbers"** are identified as the situations, which retard the productivity of a person or, a group of people engaged in a particular activity. List *ten (10)* of the most significant time robbers that hinder the productivity of construction project managers as applicable to the Sri Lankan context.

(06 marks)

iv.) Productivity of people involved in any endeavour, is greatly influenced by **physiological** as well as **psychological** aspects related to human beings. Describe and discuss the bearing of following factors, on construction productivity;

a.) Stress condition of the person concerned   b.) Energy cycle of the individual

(07 marks)

SECTION B – QUANTITATIVE TECHNIQUES

Q4.

Diameters of 20 stampings of a dropforging machine (in cm) are given in the table below.

20.1	20.1	20.2	20.3	19.9	19.7	19.6	19.3	19.5	19.2
19.8	20.3	20.6	20.4	19.9	19.8	20.2	20.3	20.4	20.5

i.) Compute the sample mean of the diameters of stampings and interpret it.

(04 marks)

ii.) Compute the sample median of the diameters.

(04 marks)

iii.) Compare the advantages and disadvantages of the measures of location computed in parts i.) and ii.).

(05 marks)

iv.) Compute the sample variance of the diameters of stampings.

(03 marks)

v.) Compute the mean absolute deviation of the diameters of stampings and interpret it.

(04 marks)

vi.) Compare the advantages and disadvantages of the measures of dispersion computed in parts iv.) and v.).

(05 marks)

Q5.

A computer store purchases network cards from one of the two distributors A and B. Amount of defectives in the supply by A is about 2%, while with B it is about 3%. A lot of 1000 network cards consist of about 60% supplied by A. From this lot of 1000 network cards, a batch of 20 network cards is randomly selected for inspection.

i.) Compute the probability of finding defective network card.

(05 marks)

ii.) Estimate the expected number of defective network cards out of the 20 cards inspected.

(05 marks)

iii.) What is the probability that all 20 network cards inspected are in good condition?

(05 marks)

iv.) What is the probability of finding at least one defective network card from the batch of 20?

(05 marks)

v.) Suppose the store can earn a profit of Rs. 150/- from each of the network cards in good condition and the loss from each of the defective network card is Rs. 50/-. Estimate the net profit for the computer store from the lot of 1000 network cards.

(05 marks)

Q6.

A cement manufacturer claims that their new blended cement has superior early strength as compared to what is presently available in the market. Mortar cube crushing strengths (in MPa) at 3 days, of 20 standard samples with the new cement is given below. Assuming that the crushing strengths are normally distributed, and the mean crushing strength of standard mortar cubes with presently available cements in the market is 6.0 MPa, answer the following.

| 5.9 | 6.1 | 5.3 | 6.4 | 5.7 | 5.9 | 6.2 | 6.1 | 5.7 | 5.7 |
| 5.6 | 6.4 | 6.4 | 6.2 | 6.1 | 6.3 | 5.8 | 5.9 | 5.9 | 6.0 |

i.) Give an estimate for the mean cube crushing strength with the new cement.

(03 marks)

ii.) Clearly state the null and the alternative hypotheses you would test to examine the validity of the cement manufacturer's claim, stating whether it is one sided or a two sided hypothesis.

(05 marks)

iii.) Suggest a test statistic that can be used to test the validity of the hypothesis stated in part ii.).

(04 marks)

iv.) Test the hypothesis stated in part ii.) using a 5% level of significance and clearly state your conclusions.

(08 marks)

v.) Will you still use the statistic stated in part iii.), if the population variance of the crushing strengths with the new cement is known to be 2 MPa? If not, suggest the changes.

(05 marks)