



**CEX7107 - Construction Productivity & Quantitative Techniques**

**FINAL EXAMINATION - 2012/2013**

**Time Allowed: Three Hours**

**Date: 2013 - 08 - 06 (Tuesday)**

**Time: 0930 - 1230 hrs**

**Answer Four (04) questions.**

**Section A - Construction Productivity**

**Q1.**

- i.) Describe the procedure involved in Work Measurement (Time Study) with particular reference to "rating" as defined in BS 3138. Specifically discuss the factors affecting the rating for typical construction operations.  
(08 marks)
- ii.) Describe in detail the basic stages involved in carrying out a method study and discuss the utility of Multiple Activity Charts in the process.  
(08 marks)
- iii.) Discuss the advantages of using the method known as 'Activity Sampling' in productivity evaluation of construction work in the light of convenience, economy, speed and validity.  
(09 marks)

**Q2.**

- i.) A Construction Project Engineer attending as the Chairman at a project meeting has to keep several important issues clarified and a few strategic steps planned in advance so as to make the outcome of the meeting advantages to the project and improve the productivity. Identify and describe these issues and strategic steps.  
(08 marks)
- ii.) Clearly identify *five (05)* significant factors that could affect the Productivity of a construction site and describe them.  
(08 marks)
- iii.) Discuss differences between **Remuneration** and **Incentives** and compare the advantages and disadvantages of following three financial incentive schemes applied to workers engaged in road construction work.
  - i.) Piecework schemes
  - ii.) Hours saved schemes
  - iii.) Geared schemes
 (09 marks)

**Q3.**

- i.) 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.  
(08 marks)
- ii.) "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.  
(08 marks)
- iii.) 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
 (09 marks)



**SECTION B – QUANTITATIVE TECHNIQUES**

**Q4.** A bus depot has a fleet of 192 busses. The table below gives the distance traveled, before a major engine failure.

Distance traveled (in 1000 km)	0 - < 30	30 - < 60	60 - < 90	90 - < 120	120 - < 150	150 - < 180	180 - < 210	210 - < 240
Frequency	3	10	18	27	40	48	36	10

- i.) Summarize the above information in a histogram. (05 marks)
  - ii.) Estimate the distance traveled by a randomly chosen bus before its first engine failure. (05 marks)
  - iii.) Compute the sample median. (05 marks)
  - iv.) Estimate the proportion of buses of this type that operate for at least 200,000 km before the first major engine failure. (05 marks)
  - v.) Estimate the proportion of buses that have the first major engine failure before operating 50,000 km. (05 marks)
- Q5.** A Contractor buys precast/prestressed purlins from two manufacturers P and Q. Around 2% of the purlins supplied by P are defective and about 3% by Q are defective. A lot of 1000 purlins consist of about 60% supplied by P. From this lot of 1000 purlins, a batch of 20 is randomly selected for inspection.
- i.) Compute the probability of finding defective purlin from the lot of 1000. (05 marks)
  - ii.) If an inspected purlin is found to be defective, what is the probability that it was supplied by manufacturer P. (05 marks)
  - iii.) What is the probability that all 20 purlins inspected are in good condition? (05 marks)
  - iv.) What is the probability of finding at least one defective purlin from the batch of 20? (05 marks)
  - iv.) Suppose the markup by the Contractor is Rs. 120/- from each of the purlins in good condition and the loss from each of the defective purlins is Rs. 50/-. Estimate the net profit for the Contractor from the lot of 1000 purlins. (05 marks)
- Q6.** The summary statistics obtained from a set of data on compressive strength  $x$  and intrinsic permeability  $y$  of various concrete mixes are;
- $$n = 14, \sum y_i = 572, \sum y_i^2 = 23,530, \sum x_i = 43,$$
- $$\sum x_i^2 = 157.42 \text{ and } \sum x_i y_i = 1697.80.$$
- Assume that a simple linear regression model is adequate to describe the relationship between the two variables.
- i.) Find the equation of the regression line from the method of least squares. (06 marks)
  - ii.) Use the equation of the fitted line to predict the permeability of a concrete mix with a compressive strength of 4.3. (06 marks)
  - iii.) Give a point estimate of the mean permeability when the compressive strength is 3.7. (06 marks)
  - iv.) Supposing that the observed permeability of a sample from the data set with a compressive strength of 3.7 is 46.1, calculate the value of the corresponding residual and describe what is represented by it. (07 marks)

