THE OPEN UNIVERSITY OF SRI LANKA
Department of Civil Engineering
Postgraduate Diploma in Technology - Construction Management - Level 7

CEX7107 – Construction Productivity & Quantitative Techniques

FINAL EXAMINATION – 2011/2012

Time Allowed: Three Hours

Date: 2012 - 08 - 06 (Tuesday)	Time: 0930 - 1230 hrs

Answer Four (04) questions.

Section A - Construction Productivity

Q1.

i.) Clearly differentiate between **Remuneration and Incentives.** Discuss, the *three (03)* broad areas of classification of incentives with rationale for application to different groups of employees.

(08 marks)

ii.) Discuss the advantages and disadvantages of following three financial incentive schemes when applied to workers engaged in highway construction work.
   i.) Piecework schemes   ii.) Hours saved schemes   iii.) Group schemes

(08 marks)

iii.) As a Construction Project Engineer attending a project meeting, several important issues should be clarified in your mind and a few strategic steps have to be planned in advance so as to turn the meeting to your advantage and improve the productivity. Identify and describe these issues and strategic steps.

(09 marks)

Q2.

i.) Define 'Works Study' as per BS 3138 and describe its two main segments as related to productivity improvement in construction operations.

(08 marks)

ii.) Through the statement of the definition for 'Method Study' as per BS 3138, discuss *four (04)* possible objectives of the process related to the construction industry.

(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)

Q3.

i.) Managing the working time is one of the most difficult tasks faced by Project Managers. As a result productivity of a Project Manager is significantly undermined by situations that can be described as 'Time Robbers'. Briefly describe in the context of Sri Lankan construction industry, *ten (10)* of the most significant such situations.

(08 marks)

ii.) A Construction Project Manager, by nature of his duties of coordinating construction contractors has to resort to negotiation several times in the duration of a project. Define the term "negotiation" and prepare a list of guidelines of application for the process to be effective.

(08 marks)

iii.) Describe and discuss the bearing of following factors related to personnel, on construction productivity;
       a.) Stress   b.) Energy cycle

(09 marks)

Section B – Quantitative Techniques

Q4.

Hours of service delivered by 200 units of a certain brand of incandescent light bulbs were recorded. The frequency distribution for this data is given below;

Range Service Life (h)	0 - 20	20 - 40	40 - 60	60 - 80	80 - 100	100 - 120	120 - 140	140 - 160	160 - 180	180 - 200
Frequency	6	13	16	26	34	48	34	17	3	3

  i.) Draw the corresponding histogram using relative frequencies on vertical axis. (05 marks)

  ii.) Compute the cumulative frequency distribution for the above data. (05 marks)

  iii.) Estimate the proportion of all bulbs of this type that serve for at least 100 hours. (05 marks)

  iv.) Estimate the proportion of all such bulbs that fail before operating for 50 hours. (05 marks)

  v.) Estimate the mean service life of a bulb. (05 marks)

Q5.

At a fuel depot, 40% of the customers request 2 star petrol, 35% request 3 star petrol and 25% request diesel. Out of those customers requesting 2 star petrol, only 30% fill their tanks, out of those customers requesting 3 star petrol 60% fill their tanks, while out of those requesting diesel 50% fill their tanks.

  i.) At any point of time, what is the probability that the next customer will request 3 star petrol and fill the tank. (06 marks)

  ii.) What is the probability that the next customer fills the tank. (06 marks)

  iii.) Estimate the expected number of customers who will fill their tanks out of the next 100 customers. (06 marks)

  iv.) If the next customers fills the tank, what is the probability that 2 star petrol is requested? (07 marks)

Q6.

Initially assume that the expected cost Y (Rs.) for a production run depends on the size of the run X (units). For 50 chosen X values between 5 and 20, the cost was measured. A simple linear regression model was fitted to the data and the following results were obtained.

The regression equation is $Y = -100.12 + 59.5 X$. The coefficient of determination $r^2 = 0.9$

  i.) Compute the correlation coefficient. (05 marks)

  ii.) What is the expected change in cost associated with a one unit increase in the production run? (05 marks)

  iii.) What change in cost can be expected when the size of the run is reduced by 5 units? (05 marks)

  iv.) According to the equation $Y = -100.12 + 59.5 X$, when $X = 1$ we find $Y = -40.62$. Comment on whether or not you agree that the expected cost is Rs. - 40.62 for a production run of size 1. (05 marks)

  v.) Using the regression equation, estimate the expected cost for a production run of size 10. (05 marks)