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

CEX7107 – Construction Productivity & Quantitative Techniques

FINAL EXAMINATION – 2016/2017

Time Allowed: Three Hours

Date: 2017 - 11 - 22 (Wednesday) Time: 0930 - 1230 hrs

The paper has Six (06) questions. Answer any Four (04) questions.

Section A - Construction Productivity

Q1.

i.) According to your opinion, in the context of Sri Lankan construction industry, discuss *five (05)* most significant factors that could affect the **Productivity** at a construction site.

(08 marks)

ii.) Identify and describe the important issues to be clarified and strategic steps to be planned in advance by a Construction Project Engineer attending as the **Chairman** at a regular project meeting, in order to improve the productivity of the project.

(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 a rural cascading tank system rehabilitation project.

i.) Piecework schemes ii.) Hours saved schemes iii.) Geared schemes

(09 marks)

Q2.

i.) The overall process of **Work Study** could be addressed under two fundamental segments. Describe these two segments including the basic stages involved in carrying out investigations under each of these two segments.

(08 marks)

ii.) With a description of how it could be adopted at a construction site, describe what is known as a **'Field Activity Count'**,. Discuss the process of deriving the relationship $N = Z^2P(1-P)/L^2$, after identifying each variable contained, based on theories of statistics, relating the no. of observations for a given confidance limit reflecting a certain accuracy.

(08 marks)

iii.) One of the effective ways of finding general causes of dealys in construction operations is known as a 'Forman Delay Survey'. Describe the way of conducting such a survey and discuss *five (05)* significant delay causes that should be queried through a Forman Delay Survey form.

(09 marks)

Q3.

i.) In the quest for managing his own time effectively, a Project Manager has to circumvent **'Time Robbers'** that are undermining the process. Briefly describe *ten (10)* such significant situations in the context of Sri Lankan construction industry.

(08 marks)

ii.) Define the term **'Negotiation'** and explain its importance in the context of construction industry, especially when it comes to disputes over time and cost overruns. Present a list of guidelines for the process to be effective.

(08 marks)

ii.) 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/level of the person concerned
b.) Energy cycle of the individual

(09 marks)

SECTION B – QUANTITATIVE TECHNIQUES

Q4. A construction industry survey on skilled labour employement under categories of 'Mason' and 'Carpenter' yielded the following table on the basis of age.

Age group	Masons	Carpenters	Total
15 - 24	45	17	62
25 - 34	92	23	115
35 - 44	120	49	169
45 - 54	98	56	154
Total	355	145	500

a.) Briefly explain, which graphical summary you would choose to compare the age distributions of skilled labour in the categories of Masons and Carpenters. Discuss reasons for your choice. (10 marks)

b.) When Carpenters are taken in to consideration;

i) What are the true class limits of the median class (05 marks)

ii) What is the median age? (05 marks)

iii) Estimate the proportion of carpenters younger than 30 years of age. (05 marks)

Q5. An electrical contractor purchases MCBs from a local manufacturer 'L' and a foreign manufacturer 'F'. Around 2% of the MCBs supplied by L are defective and about 3% by F are defective. A delivery assigned to a large building project consisted of 1000 MCBs with about 60% supplied by L.

i.) Compute the overall probability of finding a defective MCB from the delivery of 1000. (05 marks)

ii.) If an inspected MCB is found to be defective, what is the probability that it was supplied by manufacturer L? (05 marks)

From the above delivery of 1000 MCBs, a sample of 20 is randomly selected for inspection.

iii.) What is the probability that all 20 MCBs inspected are in good condition? (05 marks)

iv.) What is the probability of finding at least one defective MCB from the batch of 20? (05 marks)

iv.) When the markup by the Contractor is Rs. 140/- from each of the MCBs in good condition and the loss from each of the defective MCBs is Rs. 90/-. Estimate the net profit for the Contractor from the lot of 1000 MCBs. (05 marks)

Q6. The Statistical summary from a set of data on tensile strength 'x' and admixture dosing 'y' for several concrete mixes are given below;

$$n = 14, \sum y_i = 572, \sum y_i^2 = 23{,}530, \sum x_i = 43,$$

$$\sum x_i^2 = 157.42 \text{ and } \sum x_i y_i = 1697.80.$$

Assuming 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 admixture dosage of a concrete mix with a tensile strength of 4.3. (06 marks)

iii.) Give a point estimate of the mean admixture dosage when the tensile strength is 3.7. (06 marks)

iv.) Supposing that the observed admixture dosage for a sample from the data set with a tensile strength of 3.7 is 46.1, calculate the value of the corresponding residual and describe what is represented by it. (07 marks)