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 – 2013/2014

Time Allowed: Three Hours

Date: 2014 - 08 - 19 (Tuesday)

Time: 0930 - 1230 hrs

Answer Four (04) questions.

Section A - Construction Productivity

Q1.

i.) Productivity in construction is influenced by technical as well as social factors. With reasons, name and describe *five (05)* such factors that you consider to be most prominent.

(08 marks)

ii.) 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)

iii.) Discuss differences between **Remuneration** and **Incentives** and compare the advantages and disadvantages of following **three** financial incentive schemes applied to workers engaged in high rise building construction work.

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

(09 marks)

Q2.

i.) State the definition of 'Method Study' as closely as possible according to BS 3138 and describe *five (05)* main objectives of this method when applied to construction industry.

(08 marks)

ii.) 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)

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.

At a filling station, 40% of the customers request 92 Octane petrol, 35% request 95 Octane petrol and 25% request 45 Cetane diesel. Out of those customers requesting 92 Octane petrol, only 30% fill their tanks, out of those customers requesting 95 Octane 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 95 Octane 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 92 Octane petrol is requested? (07 marks)

Q5.

Based on the assumption that the expected cost Y (Rs.) for a producing a batch of cellular blocks depends on the size of the batch 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 batch size? (05 marks)

iii.) What change in cost can be expected when the size of the batch 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 batch size of 1 unit. (05 marks)

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

Q6. A cement manufacturing company claims that the limestone blended cement they have developed recently gives higher compressive strength in concrete as compared to OPC cements available in the market. The 28 day compressive strength (MPa) of 20 concrete cubes made out of the new blended cement according to a given mix proportion are given below, which could be assumed to be normally distributed. From the past experiments, it is known that for the particular mix proportion the 28 day mean compressive strength of cubes with OPC cements is 60 MPa and standard deviation is 3 MPa.

63	60	64	70	69	64	65	68	70	55
55	67	58	59	60	56	69	62	56	44

i.) (a) Estimate the mean & standard deviation for compressive strength with the new cement.
   (b) What do you think about the manufacturers comment? Breafly discuss your answer. (07 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 these are one sided or two sided hypotheses. (05 marks)

iii.) Suggest a test statistic that can be used to test the validity of the hypothesis stated in part ii.). (05 marks)

iv.) Test the hypothesis stated in part ii.) using a 5% level of significance and clearly state your conclusions. (08 marks)