THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

Faculty of Engineering & Technology

DEPARTMENT OF CIVIL AND BUILDING ENGINEERING

DIPLOMA IN CIVIL ENGINEERING

END OF COURSE EXAMINATIONS

APRIL/MAY 2010 SERIES

STATISTICS

TIME: 2 HOURS

Instructions to Candidates

You should have the following for this examination:

- Answer booklet
- Mathematical tables/Calculator

This paper consists of **FIVE** Questions
Answer question **ONE** and any other **TWO** Questions.

Question ONE

(a). Show that for counted observation, chi-square is given by $\Sigma\left(\frac{O^2}{E}\right) - N$ where O is the observed frequency, E is the Expected frequency and N the total number of observations. **(5 Marks)**

(b). Show that if $x = a + cw$ then standard deviation S_x is given by:

$S_x = C.Sw$

$S_x = C.\bar{w}$

Where a and c are constants. **(2 Marks)**

(c).

Forecast Frequency	**Observed Frequency**			
	Light	**Moderate**	**Heavy**	**Total**
Light	35	25	10	70
Moderate	20	30	15	65
Heavy	10	15	40	65
Total	**65**	**70**	**65**	**200**

Using Chi-Square test, determine whether the results indicate a measure of skill in the forecasts or if they could be due to chance. **(23 Marks)**

Question TWO

The following results were obtained when six measurements of the extension in centimeters of a steel bar were taken:

0.241, 0.238, 0.244, 0.250, 0.240, 0.245

Calculate:

(a). Mean **(5 Marks)**

(b). Standard deviation. **(10 Marks)**

(c). Coefficient of variation. **(5 Marks)**

Question THREE

From a particular watershed, records from 12 rain gauges are available. Records from 4 of their gauges are known to be bad. If 6 records are randomly selected from 12 records.

(a). What is the probability that 1 bad record will be selected. **(5 Marks)**

(b). What is the probability that 4 bad records will be selected. **(7 Marks)**

(c). What is the probability that atleast 1 bad record will be selected. **(8 Marks)**

Question FOUR

(a). What is the probability a 20 year flood will occur for the 1^{st} time during the 8^{th} year, after the completion of a project? **(6 Marks)**

(b). What is the probability that it will be at the 8^{th} year before a 20 year flood occurs. **(5 Marks)**

(c). What is the probability that the 4^{th} occurrence of a 10 year flood will be on the 40^{th} year? **(9 Marks)**

Question FIVE

Suppose that a foundation engineer wanting to estimate the long term settlement of a footing states that the total sustained load on the footing is the sum of the dead load of the structure and the load imposed by furniture and the occupancy loads.

Since each load is the sum of many relatively small weights the engineer adopts the assumption that the dead Load x and the sustained occupancy load Y are normally distributed.

Unable to see any important correlation between them he also decides to treat X and Y as independent. Data from numerous buildings of a similar type suggest to him that:

$\mu_x = 100 kips, \quad \Gamma_x = 10 kips$

$\mu_y = 40 kips, \quad \Gamma_y = 10 kips$

(a). What is the distribution of the total Sustained Load.
$\omega = x + y$ **(3 Marks)**

(b). If a reasonable design Load is that, load which will be exceeded only with 5% probability. Calculate the load. **(7 Marks)**

(c). At a certain location the annual rainfall precipitation is approximated normally distributed with mean of 45´´ and a standard deviation of 15´´. Annual runoff can be approximately by R=-7.5 +0.5P, where R is annual runoff and P is annual precipitation. What is the probability that the annual runoff will exceed 30´´. **(10 Marks)**