**M.TECH. DEGREE EXAMINATION, December 2013**

**Branch: Civil Engineering**

**Specialization :**

1. **Environmental Engineering**
2. **Transportation Engineering**

**Model Question Paper - I**

**First Semester**

**MCETE101/MCEEE 101 APPLIED STATISTICS & PROBABILITY**

(Regular – 2013 Admissions)

Time : Three Hours Maximum : 100 marks

***Instructions: 1) Answer questions in full.***

***2) Assume suitable data wherever necessary.***

(i) State and prove the following (i) Baye’s theorem (ii) Addition theorem . (15 marks )

(ii) Find the first four central moments for the following data.

X: 1 2 3 4 5 6 7 8 9

f: 1 6 13 25 30 22 9 5 2

(10 marks)

**OR**

2. (i) Fit a Normal Distribution and hence find the theoretical frequencies

Class: 120-130 130-140 140-150 150-160 160 -170 170 -180

Freq: 2 2 14 22 25 20 ( 25 marks )

3. (i) From the following data obtain the regression equations

Sales: 91 97 108 121 67 124 51 73 111 57

Purchase: 71 75 69 97 70 91 39 61 80 47 ( 10 marks )

(iii) The following are the data on the drying time of a certain varnish and the amount of

additive that is intened to reduce the drying time .

Amount of

varnish additive ( gms ) : 0 1 2 3 4 5 6 7 8

Drying time : 12.0 10.5 10.0 8.0 7.0 8.0 7.5 8.5 9.0

1. Draw a scatter diagram to verify that it is reasonable to assume that the relationship is parabolic
2. Fit a second degree polynomial with the method of least squares
3. Use the result of part (ii) to predict the drying time of the varnish when 6.5 gms of the additive is being used . ( 15 marks )

**OR**

1. (i) Expalin systematic sampling and stratified sampling with its major applications in

environmental engineering

1. marks )
2. (i) Discuss different types of tests of significance concerning small samples .

( 15 marks )

(ii) Define (a) Type I error (b) Type II error (c) Level of significance of a test. Find how many

heads in 54 tosses of a coin will ensure its fairness at 5% level of significance.

( 10 marks )

**OR**

1. (i) Records taken of the number of male and female births in 800 families having four

children are as follows:

No. of male births : 0 1 2 3 4

No. of female births : 4 3 2 1 0

No. of families : 32 178 290 236 94

Test whether the data are consistent with the hypothesis that the binomial law holds

and the chance of male birth is equal to that of the female birth, namely, p = q = .



( 15 marks )

(ii) The following are the number of minutes it took 10 mechanics to assemble a piece of

machinery in the morning, X and in the afternoon Y

X : 11.1 10.3 12.0 15.1 13.7 18.5 17.3 14.2 14.8 15.3

Y : 10.9 14.2 13.8 21.5 13.2 21.1 16.4 19.3 17.4 19.0

Calculate r .Test the null hypothesis ρ =0 against the alternative hypothesis ρ ≠0 at 0,05

level of significance .

( 10 marks )

1. To find the best arrangement of instruments on a control panel of an airplane ,3 different

arrangements were tested by simulating an emergency condition and observing the

reaction time required to correct the condition . The reaction times ( tenths of a second )

of 28 pilots (randomly assigned to the different arrangements ) were as follows

Arrangement I : 14 13 9 15 11 13 14 11

Arrangement II : 10 12 9 7 11 8 12 9 10 13 9

Arrangement III : 11 5 9 10 6 8 8 7.

Test at the l s α=0,01 whether we can reject the null hypothesis that the differences among the arrangements have no effect . .

( 25marks )

**OR**

8. An Suppose it is desired to determine the effects of flue temperature and oven width on the

Time required to make coke . Suppose that 3 replicates of this experiment yielding the

following coking time in hrs

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Factor A  Oven width | Factor B  Flue temp. | Rep1 | Rep2 | Rep3 | Total |
| 4 | 1600 | 3.5 | 3.0 | 2.7 | 9.2 |
| 4 | 1900 | 2.2 | 2.3 | 2.4 | 6.9 |
| 8 | 1600 | 7.1 | 6.9 | 7.5 | 21.5 |
| 8 | 1900 | 5.2 | 4.6 | 6.8 | 16.6 |
| 12 | 1600 | 10.8 | 10.6 | 11 | 32.4 |
| 12 | 1900 | 7.6 | 7.1 | 7.3 | 22.0 |
| Total | | 36.4 | 34.5 | 37.7 | 108.6 |

Perform an analysis of variance based on this two factor experiment and test the

significance of the factorial effect using 0.01 level of significance . ( 25 marks )