Reg. No. \_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **17MA2009** | **Duration :** | **3hrs** |
| **Sub. Name :** | **STATISTICAL DATA ANALYSIS AND**  **RELIABILITY ENGINEERING** | **Max. Marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | Find Correlation coefficient.   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | X | 105 | 104 | 102 | 101 | 100 | 99 | 98 | 96 | 93 | 92 | | Y | 101 | 103 | 100 | 98 | 95 | 104 | 96 | 92 | 97 | 94 | | CO1 | 10 |
| b. | Find Rank correlation coefficient from the following data.   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Marks inMaths | 55 | 56 | 58 | 59 | 60 | 60 | 62 | | Marks in Physics | 35 | 38 | 38 | 39 | 44 | 43 | 45 | | CO1 | 10 |
| **(OR)** | | | | |
| 2. | a. | Fit a second degree parabola to the following data.   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | x | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | | y | 2 | 6 | 7 | 8 | 10 | 11 | 11 | 10 | 9 | | CO6 | 10 |
| b. | Fit a curve of the form y = abx to the following data   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | x | 1 | 2 | 3 | 4 | 5 | 6 | | y | 151 | 100 | 61 | 50 | 20 | 8 | | CO6 | 10 |
|  |  |  |  |  |
| 3. | a. | 200 people were affected by cholera and out of them 180 survived. Test the hypothesis that the survival rate if affected by cholera is more than 85% at (i) 1% LOS and (ii)5% LOS | CO3 | 10 |
| b. | The mean production of wheat of a sample of 100 fields is 200kg/acre, and another sample of 150 fields give mean of 220kg/acre. Assuming standard deviation of the population as 11kg, test if there is any significant difference between mean of the samples. | CO3 | 10 |
| **(OR)** | | | | |
| 4. | a. | From the following data, test whether the estimates of population variance are significantly different.   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Sample I | 15 | | 13 | | 12 | | 15 | | 12 | | 14 | | 16 | | 14 | 15 | | Sample II | 16 | 19 | | 13 | | 16 | | 13 | | 13 | | 15 | | | CO3 | 10 |
| b. | The table below gives the number of accidents that occurred during various days of the week. Test whether accidents are uniformly distributed over the week.   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | Days | Mon | Tue | Wed | Thurs | Fri | Sat | | Number of accidents | 14 | 18 | 12 | 11 | 15 | 14 | | CO3 | 10 |
|  |  |  |  |  |
| 5. |  | A company appoints four salesmen A,B,C,D and observes their sales in three seasons summer, winter and monsoon. The figures in thousands of rupees are tabulated. Analyse the variance and give your conclusion.   |  |  |  |  | | --- | --- | --- | --- | |  | Season | | | | Salesmen | Summer | Winter | monsoon | | A | 47 | 49 | 48 | | B | 51 | 49 | 53 | | C | 49 | 52 | 52 | | D | 49 | 50 | 51 | | CO2 | 20 |
| **(OR)** | | | | |
| 6. |  | Analyse the variance from the following latin square design and give your conclusion.   |  |  |  |  | | --- | --- | --- | --- | | A 12 | D 20 | C16 | B 10 | | D 18 | A 14 | B 11 | C 14 | | B 12 | C 15 | D 19 | A 13 | | C 16 | B 11 | A 15 | D 20 | | CO2 | 20 |
|  |  |  |  |  |
| 7. |  | The following table gives the measurement of 10 samples each of size 4 in the production process taken in an interval of one hour. Calculate sample mean and range. Draw control charts of mean , and range R. Comment on nature of control of the process.   |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Sample Number | | | | | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | Observed measurements | | | | | | | | | | | 15 | 10 | 8 | 12 | 18 | 20 | 15 | 13 | 9 | 6 | | 12 | 8 | 15 | 17 | 13 | 16 | 19 | 23 | 8 | 10 | | 13 | 8 | 17 | 11 | 15 | 14 | 23 | 14 | 18 | 24 | | 20 | 14 | 10 | 12 | 4 | 20 | 17 | 16 | 5 | 20 | | CO4 | 20 |
| **(OR)** | | | | |
| 8. | a. | A textile unit produces fabrics and packs them in rolls, the number of defects found in each of the rolls are given below.Construct  C-chart and comment on nature of control of the process.   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Sample number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | Number of defects | 1 | 4 | 3 | 2 | 4 | 5 | 6 | 7 | 2 | 3 |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Sample number | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | | Number of defects | 2 | 5 | 7 | 6 | 4 | 5 | 2 | 1 | 3 | 8 | | CO4 | 15 |
| b. | Determine the probability of acceptance of single sampling plan with N=1000, n=50 and c=1 for the following lots.  (i) 1% defectives  (ii) 4% defectives  (ii)10% defectives | CO4 | 5 |
|  | |  |  |  |
|  | | **Compulsory**: |  |  |
| 9. | a. | The following table gives the status report of a set of 1000 components which were put into operation simultaneously. Find the hazard rates and failure density functions.   |  |  | | --- | --- | | Operating time (hrs) | Number of surviving components | | 0 | 1000 | | 100 | 895 | | 200 | 810 | | 300 | 730 | | 400 | 660 | | 500 | 600 | | 600 | 545 | | 700 | 495 | | 800 | 450 | | 900 | 410 | | 1000 | 373 | | CO5 | 10 |
| b. | Find reliability of the sytem whose block diagram is given below.  0.2  0.2  0.1  0.3  0.3  0.4  0.4  0.7  0.6 | CO5 | 10 |