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**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

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

**End Semester Examination – Nov/Dec - 2016**

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|  |  | **Semester :** | **2016-17 ODD** |
| **Code :** | **12MA217/MA243** | **Duration :** | **3 hrs** |
| **Sub. Name :** | **Statistical Data Analysis And Reliability Engineering / Mathematics For Food Engineers** | **Max. marks :** | **100** |

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| **Q.No** | **Questions** | **Marks** |
| **PART-A(10X1=10 MARKS)** | | |
| 1. | What is the principle of Method of least squares? | 1 |
| 2. | Write the equation to the line of regression of y on x. | 1 |
| 3. | Explain the following terms: Type I Error and Type II Error. | 1 |
| 4. | What are the 95% confidence limits for estimating population proportion in large samples? | 1 |
| 5. | What is Latin square design? | 1 |
| 6. | The error degrees of freedom in a RBD with **t** treatments and **b** blocks are \_\_\_\_\_. | 1 |
| 7. | What is Control Charts? | 1 |
| 8. | SQC helps in detecting which variation? | 1 |
| 9. | Write the formula for MTTF. | 1 |
| 10. | Maintainability for T to be a random variable representing the repair time is defined as | 1 |

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| **PART B(5 X 3= 15 MARKS)** | | |
| 11. | If  are regression lines find the correlation coefficient. | (3) |
| 12. | A random sample of 500 apples was taken from a large consignment and 60 were found to be bad. Obtain the 98% confidence limits for the percentage of bad apples in the consignment. | (3) |
| 13. | State two advantages of a completely randomized experimental design. | (3) |
| 14. | Mention briefly the advantages and limitations of Statistical Quality Control (SQC). | (3) |
| 15. | If a device has a failure rate of λ(t) = 0.4 t / year where t is in years, compute the reliability for a 3 year design life assuming that no maintenance is performed. | (3) |

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| **PART C(5 X 15= 75 MARKS)** | | | |
| 16. |  | Fit a second degree Parabola of the form y =  to the following data:  X : 20 40 60 80 100 120  Y : 5.5 9.1 14.9 22.8 33.3 46.0 | 15 |
| (OR) | | | |
| 17. |  | Find the correlation coefficient from the following data:   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Price of wheat: | 65 | 66 | 67 | 67 | 68 | 69 | 70 | 72 | | Price of rice: | 67 | 68 | 65 | 68 | 72 | 72 | 69 | 71 | | 15 |
| 18. |  | The heights of 10 males of a given locality are found to be 70, 67, 62, 68, 61, 68, 70, 64, 64, 66 inches. Is it reasonable to believe that the average height is greater than 64 inches? Test at 5% level assuming that for 9 degrees of freedom P(t > 1.83) = 0.05. | 15 |
| (OR) | | | |
| 19. |  | The nicotine contents in two random samples of tobacco are given below:   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | Sample 1 | 24 | 27 | 26 | 21 | 25 |  | | Sample 2 | 27 | 30 | 28 | 31 | 22 | 36 |   Can you say that the two samples came from the same population? | 15 |
| 20. |  | A completely randomized design experiment with 10 plots and 3 treatments gave the following results Analyze the results for treatment effects.   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Plot No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | Treatment | A | B | C | A | C | C | A | B | A | B | | Yield | 5 | 4 | 3 | 7 | 5 | 1 | 3 | 4 | 1 | 7 | | 15 |
| (OR) | | | |
| 21. |  | Analyze the variance of the following Latin Square of yield of paddy where A,B,C,D denote the different method of calculation   |  |  |  |  | | --- | --- | --- | --- | | D122 | A121 | C123 | B122 | | B124 | C123 | A122 | D125 | | A120 | B119 | D120 | C121 | | C122 | D123 | B121 | A122 | | 15 |
| 22. |  | Given below are the values of sample mean  and sample range R for 10 samples, each of size 5. Construct the control chart for mean and range and comment on the nature of control.   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Sample No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | Mean | 43 | 49 | 37 | 44 | 45 | 37 | 51 | 46 | 43 | 47 | | Range | 5 | 6 | 5 | 7 | 7 | 4 | 8 | 6 | 4 | 6 |   (From the table of control chart constants for sample size n= 5 A2 = 0.577, D3 =0 and D4 = 2.115) | 15 |
| (OR) | | | |
| 23. |  | Ina factory producing spark plugs, the number of defective found in the inspection of 15 lots of 100 each is given below. Draw the control chart for the number of defectives and comment on the state of control.   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Sample No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | | Mean | 5 | 10 | 12 | 8 | 6 | 4 | 6 | 3 | 4 | 5 | 4 | 7 | 9 | 3 | 4 | | 15 |
| 24. |  | The density function of the time to failure of the gizmos manufactured by certain company is given by t > 0 Find:  i. The reliability function R(t) .  ii. Compute MTTF.  iii. What is the design life for a reliability 0.95%?  iv. Will a one year burning period improve the reliability, if so what is the reliability for the first year of operation? | 15 |
| (OR) | | | |
| 25. |  | A critical communication relay has a constant failure rate of 0.1/ day once it has failed the MTTR is 2.5 days.  i. What is point availability at the end of 2 days, the interval availability over a 2 day mission starting from 0 and steady state availability?  ii. If two communication relay operate in series, compute the availability at the end of 2 days.  iii. If they operate in parallel, compute the steady state availability of the system.  iv. If one communication relay operates in standby mode, what is the steady state availability? | 15 |

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