



CONTINUOUS ASSESSMENT TEST- 3

DEPARTMENT OF INFORMATION TECHNOLOGY

Course Name: Probability & Statistics

Course Code: MA 8391

Branch: IT

Year / Sem: II / IV

Duration: 3 hours

Date: 21.06.2021

Max.Marks: 100

Note: Students can be allowed to use Statistical table and control Charts

PART-A (10 x 2= 20)

Answer all the Questions.

- 1.If X is a Poisson R.V such that $P(X = 2) = 9P(X = 4) + 90P(X = 6)$, then find mean(CO1)(K1)
- 2.State Central Limit theorem (CO1)(K1)
3. A coin is tossed twice. Find the probability that both are heads given that first toss is head. (CO2)(K2)
4. If X and Y are independent random variables having variances 36 and 16 respectively, find the covariance of X+Y and X-Y (CO2)(K2)
5. What is type I and type II error (CO3)(K1)
6. A sample of 900 items has mean 3.4 cms and standard deviation 2.61 cms. Can the sample be regarded as drawn from a population with mean 3.25 cms at 5% level of significance (CO3)(K2)
- 7.What is Latin square design? (CO4)(K1)
8. If N=16 and T=32, find the correction factor. (CO4)(K1)
9. If the process fraction defective p is 0.2 and n is 25 , find the UCL for p-chart (CO5)(K2)
- 10.What is meant by tolerance limits? (CO6)(K1)

PART-B(5x16 = 80)

Answer all the Questions.

- 11.(a)(i) Find the Moment generating function of Binomial distribution. (8) (CO1) (K2)
- 11.(a)(ii) The joint pdf of random variables X and Y is given by $f(x, y) = kxye^{-(x^2+y^2)}$, $x, y \geq 0$. Find the value of k and also prove that X and Y are independent. (8) (CO1) (K2)
(or)
- 11.(b). (i) State and Prove Memoryless Property of Exponential distribution. (8) (CO1) (K2)
- 11.(b).(ii) If the joint pdf of (X,Y) is given by $f(x, y) = x + y$, $0 \leq x, y \leq 1$, find the pdf of $U = XY$. (8) (CO1) (K2)
- 12.(a) (i) State and Prove Baye's theorem. (8) (CO2) (K2)
- 12.(a) (ii) The joint probability density function of X and Y is given by (8) (CO2) (K3)

$f(x, y) = \{x + y, 0 \leq x \leq 1, 0 \leq y \leq 1\}$, otherwise . Calculate the correlation coefficient between X and Y

(or)

12.(b).(i) In a bolt factory machines A,B,C produce 25%,35% and 40% of the total output respectively. Of their outputs 5%,4%,2% are defective bolts. If a bolt is chosen at random and found to be defective, Use Baye's theorem to find the probability that it is produced by B. (8) (CO2) (K3)

12.(b).(ii) The two lines of regression are $4x - 5y + 33 = 0$ and $20x - 9y = 107$. Determine the means of x and y and the coefficient of correlation between x and y. (8) (CO2) (K3)

13.(a). (i) A company produces two makes of bulbs A and B. 200 bulbs of each make were tested and it was found that the make A had mean life of 2560 hours and S.D 90 hours, whereas make B had 2650 hours mean life and S.D 75 hours. Analyze whether there is a significant difference between the mean life of two males? (8) (CO3) (K4)

13.(a)(ii) From the following data, analyze whether there is any relation between sex and preference colour (8) (CO3) (K4)

| Sex | Male | Female |
|-------|------|--------|
| Red | 10 | 40 |
| White | 70 | 30 |
| Green | 30 | 20 |

(or)

13.(b)(i) Two independent samples of sizes 7 and 6 have the following values

| | | | | | | | |
|----------|----|----|----|----|----|----|----|
| Sample A | 28 | 30 | 32 | 33 | 31 | 29 | 34 |
| Sample B | 29 | 30 | 30 | 24 | 27 | 28 | |

Analyze whether the samples have been drawn from normal populations having the same variance using 0.05 level of significance. (8) (CO3) (K4)

13.(b)(ii) IQ tests were administered to 5 persons before and after they were trained. The results are given below

| Candidates | 1 | 2 | 3 | 4 | 5 |
|--------------------|-----|-----|-----|-----|-----|
| IQ before training | 110 | 120 | 123 | 132 | 125 |
| IQ after training | 120 | 118 | 125 | 136 | 121 |

Analyze whether there is change in IQ after the training (8) (CO3) (K4)

14.(a) An agriculture experiment on the Latin square design gave the following results for the yield of wheat per acre the letters corresponding to varieties, columns to treatments and rows to blocks. Apply ANOVA to find the variation of yield with each of these factors (16) (CO4) (K3)

| | | | | |
|-----|-----|-----|-----|-----|
| A16 | B10 | C11 | D9 | E9 |
| E10 | C9 | A14 | B12 | D11 |
| B15 | D8 | E8 | C10 | A18 |
| D12 | E6 | B13 | A13 | C12 |
| C13 | A11 | D10 | E7 | B14 |

(or)

(b) Given the following observations for two factors A and B at two levels, use 2^2 factorial design calculate (i) the main effects (ii) make an analysis of variance (16) (CO6) (K3)

| Treatment combination | Replication I | Replication II | Replication III |
|-----------------------|---------------|----------------|-----------------|
| (1) | 10 | 14 | 9 |
| a | 21 | 19 | 23 |
| b | 17 | 15 | 16 |
| ab | 20 | 24 | 25 |

15.(a) The following data give the average life in hours and range in hours of 12 sample each of 5 lamps. Apply \bar{X} and R Charts to comment on the state of control. (16)(CO5) (K3)

| | | | | | | | | | | | | |
|-----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| \bar{X} | 120 | 127 | 152 | 157 | 160 | 134 | 137 | 123 | 140 | 144 | 120 | 127 |
| R | 30 | 44 | 60 | 34 | 38 | 35 | 45 | 62 | 39 | 50 | 35 | 41 |

(or)

15 (b)(i) The data given below are the number of defectives in 10 samples of 100 items each. Use p-chart to comment on the results. (8)(CO5)(K3)

| | | | | | | | | | | |
|------------------|---|----|---|---|---|----|---|----|----|----|
| Sample No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| No of defectives | 9 | 16 | 7 | 3 | 8 | 12 | 7 | 11 | 11 | 4 |

15.(b).(ii) The following data gives the number of defectives in 10 samples each of size 100. Use np-chart to determine whether the process is in control (8)(CO5)(K3)

| | | | | | | | | | | |
|------------------|----|----|----|----|----|----|----|----|----|----|
| Sample No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| No.of defectives | 24 | 38 | 62 | 34 | 26 | 36 | 38 | 52 | 33 | 44 |

Course Outcomes:

CO1: Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions, one dimensional and two dimensional random variables which can describe real life phenomenon.

CO2: Apply Baye's theorem to Engineering problem like Data telecasting in Information and Technology, Trend analysis concepts in Data analytics.

CO3: Testing the significant difference between sample statistic and population parameter for small and large samples in real life problems, Analyze one way and two-way classification.

CO4: Apply the basic concepts of classifications of design of experiments Latin square and factorial Design in the field of agriculture.

CO5: Apply the fundamentals of quality control and the methods used to control systems and processes.

CO6: Analyze the concept of probability distribution and Statistical techniques. such as Transformation of two dimensional random variables, Testing of Hypothesis, Design of Experiments and statistical quality control charts