**20IT401/MA003**

**Hall Ticket Number:**

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| **II/IV B.Tech (Regular / Supplementary) DEGREE EXAMINATION** | | | |
| **July/August, 2023** | **Information Technology** | | |
| **Fourth Semester** | **Probability and Statistics** | | |
| **Time:** Three Hours | | **Maximum: 7**0 Marks | |
| *Answer Question No.1 compulsorily.* | | | (14X1 = 14 Marks) |
| *Answer ONE question from each unit.* | | | (4X14=56 Marks) |
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| 1 | a) | | | Write the properties of the probability density function. | CO1 | L1 |  |
|  | b) | | | The mean and variance of the gamma distribution are 16 and 64. Find the parameters α and β. | CO1 | L2 |  |
|  | c) | | | State the probability density function of Weibull distribution. | CO1 | L1 |  |
|  | d) | | | Write any two applications of Normal Distribution. | CO1 | L1 |  |
|  | e) | | | Define the terms population and sample. | CO2 | L1 |  |
|  | f) | | | Define Null Hypothesis and Alternative Hypothesis. | CO2 | L1 |  |
|  | g) | | | Define Point estimation and give example. | CO2 | L1 |  |
|  | h) | | | Write the (1 – α)100% large sample confidence interval for μ. | CO2 | L2 |  |
|  | i) | | | Define Type – I and Type – II errors. | CO3 | L1 |  |
|  | j) | | | Write the test statistic for matched pair comparisons. | CO3 | L1 |  |
|  | k) | | | Find the value of F0.99(8,8). | CO3 | L1 |  |
|  | l) | | | A random sample of size 100 has a standard deviation of 5. what can you say about the maximum error with 95% confidence. | CO4 | L3 |  |
|  | m) | | | Write the normal equations for straight line. | CO4 | L1 |  |
|  | n) | | | Write the Properties of regression coefficients. | CO4 | L1 |  |
|  | | **Unit - I** | | | | | |
| 2. | a) | | If the probability density function  f  Find the value of (i) k , (ii) mean, and (iii) find the probability between x=1/2 and x=3/2 | | CO1 | L3 | 7M |
|  | b) | | If the annual proportion of erroneous income tax returns filed with the IRS can be looked upon as a random variable having a beta distribution with α = 2 and β = 9, what is the probability that in any given year there will be fewer than 10% erroneous returns? | | CO1 | L4 | 7M |
|  | | **(OR)** | | | | | |
| 3. | a) | | A sample of 100 dry battery cells tested to find the length of life produced the following results: =12 hours, σ=2 hours. Assuming the data to be normally distributed. What percentage of battery cells are expected to have life? i)More than 15 hours ii) Less than 6 hours iii) Between 10 and 15 hours? | | CO1 | L2 | 7M |
|  | b) | | The joint distribution of X & Y is given by 3. Find (i)the value of k (ii)P(X=3,Y≤2),P(X≤2,Y=3),P(X=2) | | CO1 | L4 | 7M |
|  | | **Unit - II** | | | | | |
| 4. | a) | | Hard disks for computers must spin evenly, and one departure from level is called roll. The roll for any disk can be modeled as a random variable having mean 0.2250 mm and standard deviation 0.0042 mm. The sample mean roll will be obtained from a random sample of 40 disks. What is the probability that will lie between 0.2245 and 0.2260 mm. | | CO2 | L3 | 7M |
|  | b) | | In a random sample of 60 workers, the average time taken by them to get to work is 33.8 minutes with a standard deviation of 6.1 minutes. can we reject the null hypothesis = 32.6 minutes in favour of alternative null hypothesis 32.6 at =0.025 level of significance. | | CO2 | L3 | 7M |
|  | | **(OR)** | | | | | |
| 5. | a) | | A sample of 400 items is taken from a population whose standard deviation is 10. The mean of the sample is 40. Test whether the sample has come from a population with mean 38. Also calculate 95 % confidence interval for the population. | | CO2 | L3 | 7M |
|  | b) | | A random sample of 6 steel beams has a mean compressive strength of 58,392 psi (pounds per square inch) with a standard deviation of 648 psi. Use this information and the level of significance  to test whether the true average compressive strength of the steel from which this sample came is 58,000 psi. Assume normality. | | CO2 | L4 | 7M |
| **P.T.O**  **20IT401/MA03**  **Unit - III** | | | | | | | |
| 6. | a) | | The mean height of 50 students who participated in sports is 68.2 inches with the standard deviation of 2.5 inches. The mean height of 50 students who have not participated in sports is 67.2 inches with a standard deviation of 2.8 inches. Test the hypothesis that the height of students who participated in sports is more than the students who have not participated in sports at 1% level of significance. | | CO3 | L3 | 7M |
|  | b) | | A sample of 100 bulbs produced by company A showed a mean life time 1190 hours and a S.D of 90 hours. A sample of 75 bulbs produced by a company B showed a mean life time of 1230 hours with a S.D. of 120 hours. Is there difference between the mean life times of the two brands at a significance level of 0.05?. | | CO3 | L4 | 7M |
|  | | **(OR)** | | | | | |
| 7. | a) | | Two Horses A & B were tested according to the time (in seconds) to run a particular track with the following results.   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Horse A | 28 | 30 | 32 | 33 | 33 | 29 | 34 | | Horse B | 29 | 30 | 30 | 24 | 27 | 29 | -- |   Test Whether the two horses have the same running capacity. | | CO3 | L2 | 7M |
|  | b) | | Playing 10 rounds of gold on his home course, a golf professional averaged 71.3 with a standard deviation of 1.32. Test the null hypothesis that the consistency of his game on his home course is actually measured by =1.20, against the alternative hypothesis that he is less consistent. Use the level of significance α= 0.05. | | CO3 | L4 | 7M |
|  | | **Unit - IV** | | | | | |
| 8. | a) | | Calculate the correlation coefficient from the following data:   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | X | 56 | 42 | 72 | 36 | 63 | 47 | 55 | 49 | | Y | 147 | 125 | 160 | 118 | 149 | 128 | 150 | 145 | | | CO4 | L3 | 7M |
|  | b) | | The performance of a computer is observed over a period of 2 years to check the claim that the probability is 0.20 that its downtime will exceed 5 hours in any given week. Testing the null hypothesis p = 0.20 against the alternative hypothesis p ≠ 0.20, what can we conclude at the level of significance α= 0.05, if there we only 11 weeks in which the own time of the computer exceeded 5 hours? | | CO4 | L4 | 7M |
|  | | **(OR)** | | | | | |
| 9. | a) | | The owner of a machine shop must decide which of two snack-vending machines to install in his shop. If each machine is tested for 250 times and the first machine fails to work (neither delivers the snack nor returns the money) 13 times and the second machine fails to work 7 times, test at the 0.05 level of significance whether the difference between the corresponding sample proportions are significant. | | CO4 | L4 | 7M |
|  | b) | | The following are the measurements of the air velocity and evaporation coefficient of burning fuel droplets in an impulse engine:   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Air Velocity | 20 | 60 | 100 | 140 | 180 | 220 | 260 | 300 | 340 | 380 | | Evo. Coeff.(/Sec) | 0.18 | 0.37 | 0.35 | 0.78 | 0.56 | 0.75 | 1.18 | 1.36 | 1.17 | 1.65 |   Fit a simple linear regression model to the above data | | CO4 | L4 | 7M |

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