**20MA003**

**Hall Ticket Number:**

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| **II/IV B.Tech (Regular / Supplementary) Degree Examination** | | | |
| **February, 2023** | **Common to CB/CS/CE/DS/EC/EE/EI & ME Branches** | | |
| **Third Semester** | **Probability & 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) | | | Define Probability density function. | CO1 | L1 |  |
|  | b) | | | When do you say that two random variables are independent? | CO1 | L2 |  |
|  | c) | | | Find the value of . | CO1 | L2 |  |
|  | d) | | | Define uniform distribution. | CO1 | L1 |  |
|  | e) | | | Define the terms population and sample. | CO2 | L1 |  |
|  | f) | | | Write the confidence interval for a true mean. | CO2 | L2 |  |
|  | g) | | | Define null hypothesis and alternative hypothesis. | CO2 | L1 |  |
|  | h) | | | State Type-1 and Type-2 errors. | CO2 | L1 |  |
|  | i) | | | Find the value of . | CO3 | L3 |  |
|  | j) | | | When we say a sample is said to be small? | CO3 | L1 |  |
|  | k) | | | Write the test statistic for difference between two estimates of population variance. | CO3 | L3 |  |
|  | l) | | | Define regression. | CO4 | L1 |  |
|  | m) | | | Write the normal equations of . | CO4 | L2 |  |
|  | n) | | | Explain ANOVA. | CO4 | L3 |  |
|  | | **Unit – I** | | | | | |
| 2. | a) | | If a random variable has the probability density ,  find the value of C and the probabilities that it will take on a value (i) between 1 and 3 , (ii) greater than 0.5 . | | CO1 | L4 | 7M |
|  | b) | | If a random variable has the Gamma distribution with and  (i) find the mean and standard deviation of this distribution.  (ii) find the probability that the random variable will take on a value less than 4. | | CO1 | L3 | 7M |
|  | | **(OR)** | | | | | |
| 3. | a) | | The joint density of two continuous random variables X and Y is .  Find (i) the value of c (ii) P(X ≥ 3,Y < 2) (iii) P(X + Y < 3). | | CO1 | L4 | 7M |
|  | b) | | The time required to assemble a piece of machinery is a random variable having approximately a normal distribution with  minutes and minutes . What are the probabilities that the assembly of a piece of machinery of this kind will take (i) at least 11.5 minutes ; (ii) anywhere from 11.0 to 14.8 minutes ? | | CO1 | L3 | 7M |
|  | | **Unit – II** | | | | | |
| 4. | a) | | The time at the counter for a customer to be served at a post office can be modeled as a random variable having mean 176 seconds and variance 256. The sample mean will be obtained from the times for a random sample of 1000 customers. What is the probability that will be between 175 and 178 seconds ?  **P.T.O**  **20MA003** | | CO2 | L3 | 7M |
|  | b) | | The average breaking strength of the steel rods is specified to be 18.5 thousand pounds . To test this sample of 14 rods were tested , the mean and standard deviation were 17.85 and 1.95 respectively. Is the result of the experiment significant. | | CO2 | L4 | 7M |
|  | | **(OR)** | | | | | |
| 5. | a) | | A random sample of size 16 values form a normal population showed a mean of 53 and a sum of squares of deviations from the mean equals to 150. Obtain 95% confidence limits of the mean of the population. | | CO2 | L4 | 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 | L3 | 7M |
|  | | **Unit – III** | | | | | |
| 6. | a) | | The lapping process which is used to grind certain silicon wafers to the proper thickness is acceptable only if, the population standard deviation of the thickness of dice cut from the wafers is at most 0.50 mil. Use the 0.05 level of significance to test the null hypothesis =0.50 against the alternative hypothesis > 0.50, if the thickness of 15 dice cut from such wafers have a standard deviation of 0.64 mil. | | CO3 | L4 | 7M |
|  | b) | | The following random samples are measurements of the heat producing capacity (in millions of calories per ton) of specimens of coal from two mines:   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | Mine 1: | 8,260 | 8,130 | 8,350 | 8,070 | 8,340 |  | | Mine 2: | 7,950 | 7,890 | 7,900 | 8,140 | 7,920 | 7,840 |   Use the 0.01 level of significance to test whether the difference between the means of these two samples is significant. | | CO3 | L2 | 7M |
|  | | **(OR)** | | | | | |
| 7. | a) | | If 31 measurements of the boiling point of sulphur have a standard deviation of 0.83 degree Celsius, construct a 98% confidence interval for the true standard deviation of such measurements .What assumption did you make about the population? | | CO3 | L4 | 7M |
|  | b) | | To test the claim that the resistance of electric wire can be reduced by more than 0.05 ohm by alloying, 32 values obtained for standard wire yielded ohm and s1 = 0.004 ohm, and 32 values obtained for alloyed wire yielded  ohm and s2 = 0.005 ohm. At the 0.05 level of significance, does this support the claim? | | CO3 | L3 | 7M |
|  | | **Unit – IV** | | | | | |
| 8. | a) | | In a city 325 men out of 600 were found to be smokers. Does this data support the conclusion that the majority of men in the city are smokers? | | CO4 | L2 | 7M |
|  | b) | | Fit a second degree polynomial to the following data by the method of least squares   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | X | 1 | 5 | 7 | 9 | 12 | | Y | 10 | 15 | 12 | 15 | 21 | | | CO4 | L3 | 7M |
|  | | **(OR)** | | | | | |
| 9. | a) | | Calculate correlation coefficient for the following data   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Wages | 100 | 101 | 102 | 102 | 100 | 99 | 97 | 98 | 96 | 95 | | Cost of living | 98 | 99 | 99 | 97 | 95 | 92 | 95 | 94 | 90 | 91 | | | CO4 | L4 | 7M |
|  | b) | | Fit a straight line to the following data by the method of least squares   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | x | 0 | 1 | 2 | 3 | 4 | | y | 1 | 1.8 | 1.3 | 2.5 | 6.3 | | | CO4 | L3 | 7M |

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