**20MA003 (20CB/CE/CS/DS/EC/EE/EI/ME 301)**

**Hall Ticket Number:**

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| **II/IV B.Tech (Regular) DEGREE EXAMINATION** | | | |
| **March, 2022** | **Common to CB, CE, CS, DS, EC, EE, EI & ME** | | |
| **Third 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) | | Define a continuous random variable. | CO1 | |  |
|  | b) | | Write the probability density function of uniform distribution. | CO1 | |  |
|  | c) | | If X1 has mean 4 and variance 9 and X2 has mean -2 and variance 5 and the two are independent random variables. Find. | CO1 | |  |
|  | d) | | State central limit theorem. | CO2 | |  |
|  | e) | | Find the value of the finite population correction factor for . | CO2 | |  |
|  | f) | | Define null hypothesis. | CO2 | |  |
|  | g) | | Find the value of . | CO2 | |  |
|  | h) | | Write the test statistic for hypothesis concerning for one variance. | CO3 | |  |
|  | i) | | Define large sample. | CO3 | |  |
|  | j) | | Define Type-1 and Type-II errors. | CO3 | |  |
|  | k) | | Write the test statistic for one proportion. | CO4 | |  |
|  | l) | | Define correlation. | CO4 | |  |
|  | m) | | Write normal equations to fit a straight line . | CO4 | |  |
|  | n) | | Write F ratio for treatment in ANOVA. | CO4 | |  |
| **Unit - I** | | | | | | |
| 2. | a) | The phase error in a tracking device have probability density .  Find the probability that the phase error is (a) between 0 and ; (b) greater than . | | CO1 | | 7M |
|  | b) | If X is a Normal variate with mean 30 and Standard deviation 5. Calculate the probability that i) ii) | | CO1 | | 7M |
| **(OR)** | | | | | | |
| 3. | a) | 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 5. | | CO1 | | 7M |
|  | b) | If two random variables have the joint density    Find the probabilities that it will take on a value   1. between 1 and 3 ii) greater than 0.5 | | CO1 | | 7M |
| **Unit - II** | | | | | | |
| 4. | a) | When we sample from an infinite population, what happens to the standard error of the mean if the sample size is  (i) increased from 50 to 200; (ii) increased from 400 to 900;  (iii) decreased from 225 to 25; (iv) decreased from 640 to 40. | | CO2 | | 7M |
|  | b) | A random sample of 16 observations is taken from a normal population having mean 3.42 and standard deviation 0.68 . Find 95% confidence interval for true mean. | | CO2 | | 7M |
| **(OR)** | | | | | | |
| 5. | a) | 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 | | 7M |
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|  | b) | According to the norms established for a mechanical aptitude test, persons who are age 18 years old should average 73.2 with a standard deviation of 8.6. If 45 randomly selected persons of that age averaged 76.7, test the null hypothesis  µ = 73.2 against the alternative hypothesis at the 0.01 level of significance. | | CO2 | | 7M |
| **Unit - III** | | | | | | |
| 6. | a) | The means of two random samples of sizes 9 and 7 are 196.42 and 198.82 respectively. The sum of the squares of the deviations from the mean are 26.94 and 18.73 respectively. Can the samples be drawn from the same population. | | CO3 | | 7M |
|  |  |  | |  | |  |
|  | b) | 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 | | 7M |
| **(OR)** | | | | | | |
| 7. | a) | 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 | | 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 | | 7M |
| **Unit - IV** | | | | | | |
| 8. | a) | In a random sample of 600 cars making a right turn at a certain intersection, 157 pulled into wrong lane. Test the null hypothesis that actually 30% of all drivers make this mistake at the given intersection, using the alternative hypothesis p  0.30 and the level of significance = 0.05. | | CO4 | 7M | |
|  | b) | Fit a straight line to the following data by the method of least squares   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | X | 1 | 5 | 7 | 9 | 12 | | Y | 10 | 15 | 12 | 15 | 21 | | | CO4 | 7M | |
| **(OR)** | | | | | | |
| 9. | a) | The following are the numbers of mistakes made in 5 successive days for 4 technicians working for a photographic laboratory   |  |  |  |  | | --- | --- | --- | --- | | Technician I | Technician II | Technician III | Technician IV | | 6 | 14 | 10 | 9 | | 14 | 9 | 12 | 12 | | 10 | 12 | 7 | 8 | | 8 | 10 | 15 | 10 | | 11 | 14 | 11 | 11 |   Test at the level of significance = 0.01 whether the differences among the 4 sample means can be attributed to chance. | | CO4 | | 14M |

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