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 **PRESIDENCY UNIVERSITY**

  **Bengaluru**

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| **End - Term Examinations – JANUARY 2025** |
| **Date:** 13 – 01- 2025 **Time:** 01:00 pm – 04:00 pm |

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| **School:** SOE/SOCSE | **Program:** B. Tech(First Year- Basic Engineering Science Cycle) |
| **Course Code :** MAT1003 | **Course Name :** Applied statistics |
| **Semester**: I | **Max Marks**:100 | **Weightage**:50% |

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| **CO - Levels** | **CO1** | **CO2** | **CO3** | **CO4** |
| **Marks** | **14** | **16** | **41** | **29** |

**Instructions:**

1. *Read all questions carefully and answer accordingly.*
2. *Do not write anything on the question paper other than roll number.*

**Part A**

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| **Answer ALL the Questions. Each question carries 2 marks. 10Q x 2M=20M** |
| **1** | The intelligence quotients (IQs) of 10 girls in a class are given as 70,120,110,101,88,83,95,98,107,100. Find the mean. | **2 Marks** | **L1** | **CO1** |
| **2** | Comment on the nature of mode for the following data set: 1,1,1,1,2,2,2,2,3,3,3,3,4,4,4,4,5,5,5,5,6,6,6,6  | **2 Marks** | **L1** | **CO1** |
| **3** | What is the probability of getting a sum of 9 when two dice are thrown? | **2 Marks** | **L1** | **CO2** |
| **4** | Given $P(A)$ and $P(B)$, how would you calculate $P(A∪B)$ if$ P(A∩B)$is also known? | **2 Marks** | **L1** | **CO2** |
| **5** | Write the formula for the conditional probability of A given B, and B given A. | **2 Marks** | **L1** | **CO2** |
| **6** | State the expressions for the mean and variance of a Binomial distribution. | **2 Marks** | **L1** | **CO3** |
| **7** | On average, every one out of 10 telephones is found busy. Six telephone numbers are selected at random. Find the probability that four of them will be busy.  | **2 Marks** | **L1** | **CO3** |
| **8** | In a factory, 1 in every 1000 items produced is known to be defective. Identity the probability that a random sample of 8000 will yield lesser than 4 defective items. | **2 Marks** | **L1** | **CO3** |
| **9** | What is Type I and Type II errors? | **2 Marks** | **L1** | **CO4** |
| **10** | Define null hypothesis | **2 Marks** | **L1** | **CO4** |

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| **Part B**

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|  **Answer the Questions Total 80 Marks**  |

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| **11.** | **a.** | The following data give the 2021 bonuses (in thousands of dollars) of 10 randomly selected Wall Street managers. 127,82,45,99,153,321,77,108,68,278.1. Estimate variance and standard deviation.
2. Estimate the coefficient of variance.
 | **10****Marks** | **L3** | **CO1** |
| **Or** |
| **12.** | **a.** | Consider the marks scored in MAT1003 by 10 students, each from two different sections, out of a total mark of 50 in Midterm examinations. 1. Which section students are better scorers?
2. Which section students are more consistent performers?

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| Section A  | 44  | 30  | 28  | 10  | 2  | 48  | 21  | 15  | 50  | 20  |
| Section B  | 28  | 32  | 25  | 49  | 20  | 24  | 30  | 26  | 22  | 25  |

 | **10****Marks** | **L3** | **CO1** |
|  |  |  |  |  |  |
| **13.** | **a.** |  A consulting firm rents cars from three agencies such that 50% from agency L, 30% from agency M and 20% from agency N. If 10% of the cars from l, 40% of cars from M and 50% of the cars from N are in good conditions. If a car is in good condition, What is the probability that it has come from 1. agency M and
2. agency N?
 | **10****Marks** | **L3** | **CO2** |
| **Or** |
| **14.** | **a.** | Two dice are thrown simultaneously. Find the probability of getting: 1. The same number on both dice,
2. An even number as the sum,
3. A prime number as the sum,
4. A multiple of ‘3’ as the sum,
5. A total of at least 10
 | **10****Marks** | **L3** | **CO2** |

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| **15.** | **a.** | The probability that an automobile needs to be filled with gasoline is 0.25; the probability that it needs a new oil filter is 0.40; and the probability that both the oil filter need changing and gasoline has to be filled is 0.14. 1. If the oil filter has to be changed, what is the probability that a gasoline fill is needed?
2. If a gasoline fill is needed, what is the probability that the oil filter has to be changed?
 | **10****Marks** | **L3** | **CO3** |
| **Or** |
| **16.** | **a.** | Assuming that it is true that 3 in 10 industrial accidents are due to fatigue, find the probability that: 1. Exactly 3 of 7 industrial accidents will be due to fatigue.
2. At least 3 of the 7 industrial accidents will be due to fatigue.
3. At most 3 out of 7 industrial accidents will be due to fatigue
 | **10****Marks** | **L3** | **CO3** |

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| **17.** | **a.** | It has been observed that 10 drops of water trickle every 5 minutes from a leaking pipe. What is the probability that in 5 minutes 1. exactly 6 drops of water trickle
2. at most 2 drops of water trickle

(c) at least 2 drops of water trickle? | **10****Marks** | **L3** | **CO3** |
| **Or** |
| **18.** | **a.** | The average monthly sales of ‘Reliable Computers’ are 2500 units with a standard deviation of 100 units. The sales are found to be normally distributed over months. What are the chances that the sales during a particular month will be 1. at most 2400 units
2. at least 2400 units
3. between 2450 to 2550 units

(Given that 𝑃(𝑍≤0.5) = 0.6915, 𝑃(𝑍≤1) = 0.8413). | **10****Marks** | **L3** | **CO3** |

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| **19.** | **a.** | The length of life X of certain computers is approximately normally distributed with mean $μ$ and standard deviation $σ=40 hours$. If a random sample of 30 computers has an average life of 788 hours, test the null hypothesis that $μ=800$ hours against the alternative hypothesis at (a) 1% (b) 5% and (c) 10% level of significance. If a two-tailed test shows significance, how should we proceed? | **10****Marks** | **L3** | **CO4** |

**Or**

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| **20.** | **a.** | The mean life time sample of the sample of 100 florescent bulbs produced by a company is calculated by 1635 hours with a standard deviation of 120 hours. If $μ $ is the lifetime of all bulbs produced by the company then test the hypothesis that$μ=1600$ hours at (a) 1% (b) 5% and (c) 10% LOS. What conclusions can be drawn if a two-tailed test is statistically significant? [Use Two-tailed test] | **10****Marks** | **L3** | **CO4** |
|  |
| **21.** | **a.** |  Assuming that it is true that 3 in 10 industrial accidents are due to fatigue, find the probability that:(a) Exactly 3 of 7 industrial accidents will be due to fatigue.(b) At least 3 of the 7 industrial accidents will be due to fatigue.(c) At most 3 out of 7 industrial accidents will be due to fatigue(d) none of the 7 accidents are due to fatigue(e) all the 7 accidents are due to fatigue |  **15****Marks** | **L3** | **CO3** |

**Or**

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| **22.** | **a.** | It has been observed that during the rainy season, a person reaches his office on time only 4 out of 10 days.1. Construct a suitable mathematical model, which represents the number of days out of n days, the person reaches his office on time during rainy days.
2. If it rains consecutively for 5 days, what is the probability that the person reaches his office on time exactly for 4 days?
3. If it rains consecutively for 5 days, what is the probability that the person reaches his office on time at most for 2 days?
4. If it rains consecutively for 15 days, what is the expected mean number of days on which he reaches office exactly on time?
 | **15****Marks** | **L3** | **CO3** |

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| **23.** | **a.** | A random sample of 40 geysers produced by company A have a mean life time of 647 hrs of continuous use with a standard deviation of 27 hrs, while a sample 40 produced by another company B have a mean life time of 638 hrs of continuous use with a standard deviation of 31 hrs another. Does this substantiate the claim of company A that their geysers are superior to those produced by company B at (a) 0.05 (b) 0.01 (c) 0.1 Level of Significance. [Use right tailed test]. | **15****Marks** | **L3** | **CO4** |
| **Or** |
| **24.** | **a.** | A population consists of the five numbers 2, 3, 6, 8 and 11. Consider all possible samples of size 2 that can be drawn without replacement from this population. Find 1. the mean of the population
2. the standard deviation of the population
3. the mean of the sampling distribution of means and
4. the standard deviation of the sampling distribution of means.
 | **15****Marks** | **L3** | **CO4** |

**Standard table values for Test:**

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| --- | --- | --- | --- |
| **Level of significance** | **Two tailed test** | **Right tailed test** | **Left tailed test** |
| 90% confident or level of significance = 10% =0.1 | 1.645 | 1.28 | -1.28 |
| 95% confident or level of significance = 5% =0.05 | 1.96 | 1.645 | -1.645 |
| 99% confident or level of significance = 1% =0.01 | 2.58 | 2.33 | -2.33 |

**\*\*\*\*\* BEST WISHES \*\*\*\*\***