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**PRESIDENCY UNIVERSITY**

  **Bengaluru**

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| **End - Term Examinations – MAY 2025** |
| **Date:** 22-05-2025 **Time:** 01:00 pm – 04:00 pm |

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

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| CO - Levels | CO1 | CO2 | CO3 | CO4 |
| Marks | 16 | 16 | 44 | 24 |

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 2marks. 10Q x 2M=20M** |
| 1. | The arithmetic mean of a data set with 25 observations was found to be 40. What is the sum total of the observations? | 2 Marks | L1 | CO1 |
| 2. | Consider the following data set: 1,2,3,4,5,6,7,8,8,9,9. Determine mode. | 2 Marks | L1 | CO1 |
| 3. | Define Karl Pearsons coefficient of correlation with formula. | 2 Marks | L1 | CO1 |
| 4. | $$If P\left(A\right)=0.7, P\left(B\right)=0.5, P\left(A∩B\right)=0.4, find P\left(A∪B\right).$$ | 2 Marks | L1 | CO2 |
| 5. | A coin is thrown 3 times. What is the probability that at least one head is obtained? | 2 Marks | L1 | CO2 |
| 6. | Define mutually exclusive events with example. | 2 Marks | L1 | CO2 |
| 7. | What is the mean and variance of Binomial distribution? | 2 Marks | L1 | CO3 |
| 8. | If the random variable X follows the Exponential distribution with $λ=5, $then find mean and variance. | 2 Marks | L1 | CO3 |
| 9. | Define the term “population”. | 2 Marks | L1 | CO4 |
| 10. | Define Null and Alternative hypothesis in the context of testing hypothesis. | 2 Marks | L1 | CO4 |

**Part B**

 **Answer the Questions. Total Marks 80M**

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| 11. | a. | Consider the speed (in kmph) of two vehicles recorded over the past 10 days:

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| Vehicle A | 40 | 45 | 60 | 80 | 45 | 50 | 80 | 44 | 70 | 60 |
| Vehicle B | 30 | 35 | 40 | 45 | 60 | 30 | 32 | 35 | 40 | 45 |

Determine:1. Which vehicle is more powerful?
2. Which vehicle maintained a more consistent speed?
 | 10 Marks | L3 | CO1 |
| Or |
| 12. | a. |

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| Calculate the Karl-Pearson’s correlation co-efficient for the following data:

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| X | 60 | 34 | 40 | 50 | 45 | 41 | 22 | 43 | 42 | 66 | 64 | 46 |
| Y | 75 | 32 | 35 | 40 | 45 | 33 | 12 | 30 | 36 | 72 | 41 | 57 |

Hence interpret the nature of correlation prevalent between the Variables. |

 | 10 Marks | L3 | CO1 |

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| 13. | a. | A lot of 100 semiconductor chips contain 20 that are defective. Two chips are selected at random, without replacement, from the lot. (a) What is the probability that the first one selected is defective? (b) What is the probability that the second one selected is defective given that the first one was defective? (c) What is the probability that both are defective?  | 10 Marks | L3 | CO2 |
|  |  | **Or** |  |  |  |
| 14. | a. | A university bought 45%, 25% and 30% of computers from HCL, Wipro and IBM respectively. Suppose that 2% of the computers from HCL, 3% of the computers from Wipro and 1% of the computers from IBM are found to be defective. Given a randomly chosen computer is defective, what is the probability that it is made by (i) HCL (ii) Wipro?  | 10 Marks | L3 | CO2 |

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| 15. | a. | A discrete random variable X is defined as follows

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| X | 0 | 1 | 2 | 3 | 4 |
| P(X=x) | K | 3K | 0.2 | K | 2K+0.1 |

Find the following:(i) The value of K, (ii) find the probability distribution (iii) $P(X>2)$ (iv) E(X) (v) Var (X) | 10 Marks | L3 | CO3 |
| Or |
| 16. | a. | In a certain town, the duration of a shower (in minutes) follows an exponential distribution with a mean of 5 minutes. Find the probability that:1. The shower will last for 10 minutes or more.
2. The shower will last for less than 10 minutes.
3. The shower will last between 10 and 12 minutes.
 | 10 Marks | L3 | CO3 |

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| 17. | a. | It has been observed that 2 out of 10 bulbs manufactured by a company are defective.1. Construct a suitable mathematical model, which represents the number of defective bulbs manufactured by the company out of a total of $n$ bulbs.
2. If a box of 10 bulbs is selected, what is the probability that at most 3 are defective?
3. If a box containing 10 bulbs is selected, what is the probability that more than 7 are defective?
4. If 50 bulbs each are picked up, what is the expected mean number of defective bulbs?
 | 10 Marks | L3 | CO3 |
| Or |
| 18. | 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. | 10 Marks | L3 | CO3 |

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| 19. | 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 (a) exactly 6 drops of water trickle (b) at most 2 drops of water trickle (c) at least 2 drops of water trickle?  | 10 Marks | L3 | CO3 |
| Or |
| 20. | a. | While proof reading a book, 5 misprints are found in every 3 pages. What is the probability that any given 3 pages would have (a) exactly 5 misprints (b) at most 2 misprints (c) at least 2 misprints?  | 10 Marks | L3 | CO3 |

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| 21. | 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 be1. at most 2400 units
2. at least 2400 units
3. between 2450 to 2550 units

(Given that $P\left(Z\leq 0.5\right)=0.6915, P\left(Z\leq 1\right)=0.8413$). | 10 Marks | L3 | CO3 |
| Or |
| 22. | a. | Salaries of employees of a certain organization are normally distributed with a mean of 7 LPA and standard deviation of 3 LPA. What is the probability that, for a randomly selected employee of this organization, the salary would be (a) at least 5 LPA (b) at most 5 LPA (c) between 6 and 8 LPA (Given that $P\left(Z\leq 0.33\right)=0.62930, P\left(Z\leq 0.67\right)=0.74857$). | 10 Marks | L3 | CO3 |

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| 23. | a. | A population consist of the four numbers 3, 7, 11, 15. Consider all possible samples of size 2 that can be drawn with replacement from this population. Find1. the mean of the sampling distributions of means and
2. the standard deviation of the sampling distribution of means.
 | 10 Marks | L3 | CO4 |
| Or |
| 24. | a. | A population consist of the four numbers 2,3,6,8,11. Consider all possible samples of size 2 that can be drawn **without replacement** from this population. Find1. the mean of the sampling distributions of means and
2. the standard deviation of the sampling distribution of means.
 | 10 Marks | L3 | CO4 |

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| 25. | 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. $(z\_{table}=2.58 (1\% level of significance),z\_{table}=1.96 (5\% level of significance), z\_{table}=1.645 (10\% level of significance)$ | 10 Marks | L3 | CO4 |
| Or |
| 26. | a. | An ambulance service company claims that on an average it takes 20 mins between a call for an ambulance and the patient’s arrival at the hospital. If in 6 calls the time taken (between a call and arrival at hospital) are 27, 18, 26, 15, 20, 32. Show that the company’s claim be accepted at 0.10 LOS?(𝑡𝑡𝑎𝑏𝑙𝑒= 𝑡0.10,5 = 1.476) | 10 Marks | L3 | CO4 |

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