Mahindra University Hyderabad
École Centrale School of Engineering,
Minor II

Program: B. Tech. Branch: CE, ECE, ECM, ME, MT, CSE, AI, CM, NT
Year: 2nd Semester: Fall Subject: Mathematics III (MA2103)

Date: 08/11/2023 **Start Time: 10.00 AM**
Time Duration: 90 minutes **Max. Marks: 20**

Instructions:

1. Each question carries 5 marks.
2. All questions are compulsory.
3. Please start each answer on a separate page and make sure to clearly number the responses.
4. It is essential to provide an explanation of each step. Correct outcomes without any description will not be evaluated.

5 marks

Q 1:

(a) The first of the two samples has 100 items with mean 15 and standard deviation 3. If the whole group has 250 items with mean 15.6 and standard deviation $\sqrt{13.44}$, find the standard deviation of the second group.

(b) The mean, median, and mode salaries of five employees are ₹34200, ₹35300, and ₹36600, respectively. What is the new mean if the highest-paid employee gets a ₹4200 raise? What about the new median? What will be your understanding regarding the new mode?

5 marks

Q 2:

Let X be a discrete random variable with a Poisson distribution with parameter $\lambda > 0$. Compute the moment-generating function (M.G.F.) of X and the coefficient of skewness.

Q 3: 5 marks

(a) Does there exist a random variable X for which $P(\mu - 2\sigma \leq X \leq \mu + 2\sigma) = 0.6$? Here μ and σ are the mean and standard deviation of X, respectively.

(b) If X is a random variable such that $E[X] = 3$ and $E[X^2] = 13$, use the Chebyshev inequality to determine a lower bound for $P(-2 < X < 8)$.

Q 4: 5 marks

Let X be a binomial random variable with $n = 100$, $p = 0.5$. Compare Markov's inequality and exact probability for the event $\{X > 1\}$.
