

2112

ROLL NUMBER				
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SET A



# INDIAN SCHOOL MUSCAT

## SECOND PERIODIC TEST (2023-2024)

### APPLIED MATHEMATICS

CLASS: XII

Sub. Code: 241

Time Allotted: 50mins.

22.05.2023

Max .Marks: 20

#### GENERAL INSTRUCTIONS:

- This question paper has three sections.
- Section A contains 3 MCQ and 1 Assertion Reasoning Question, each of 1 mark.
- Section B contains 3 questions of 2 marks each.
- Section C contains 2 questions of 3 marks each.
- Section D contains 1 Case Based Question of 4 marks.
- All questions are compulsory.

Use the following values if required:

$$P(z > -1.65) = 0.95, \quad P(X < 0.67) = 0.7486, \quad P(z < 0.33) = 0.6293, \quad P(z < 1.33) = 0.9082 \quad \text{and} \\ e^{-2.4} = 0.0907$$

#### SECTION A

1. If the expectation of a Poisson variable is 1, then find  $P(X > 1)$ . 1  
 a)  $e^{-1}$       b)  $2e^{-1}$       c)  $1 - e^{-1}$       d)  $1 - 2e^{-1}$
2. For a random variable X,  $E(X) = 3$  and  $E(X^2) = 11$ . Then the variance of X is 1  
 a) 2      b) 8      c) 6      d) information not sufficient.
3. If X be a normal variate with mean 3 and variance 16, then the value of t such that 1  
 $P(3 < X < t) = 0.4772$ .  
 (a) 6      (b) 2      (c) 11      (d) 5

#### ASSERTION-REASON BASED QUESTION

In question 4, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

- (a) Both A and R are true and R is the correct explanation of A.  
 (b) Both A and R are true but R is not the correct explanation of A.  
 (c) A is true but R is false.  
 (d) A is false but R is true.
4. **Assertion:** The probability distribution can have Mean = 3 and Standard Deviation = 2. 1  
**Reason:** Standard deviation is always less than the mean of a distribution.

## SECTION B

5. The mean of a normal distribution is 50 and 5% of the values are greater than 60. Find the standard deviation of the distribution. 2
6. The incidence of occupational disease in an industry is such that the workers have 20 percent chance of suffering from it. What is the probability that out of six workers 4 or more will come in contact of the disease? 2
7. For the probability distribution given below, 2

X	0	1	2	3
P(X)	k	3k	3k	k

find the value of

- i) k ii) Find E(X)

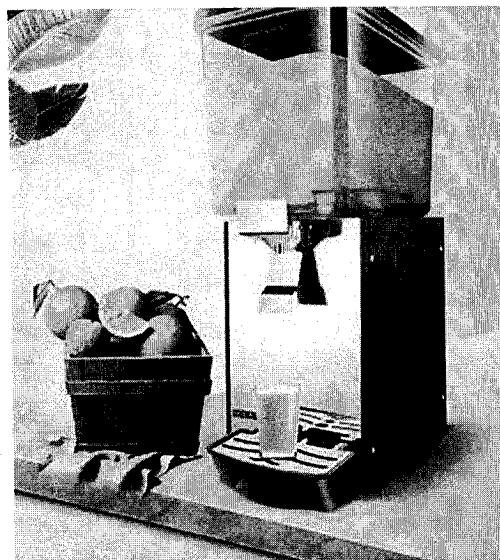
## SECTION C

8. The station master of lucknow Junction knows from his past experience that only 4% of the trains arrive late at lucknow Junction. On any day 60 trains arrive at the junction and the station master claims that not more than 5% of the trains arrive late at lucknow Junction. If the random variable associated with number of trains arriving late approximates with Poison's distribution, Check if station masters claim is justified? 3
9. In a discrete probability distribution the probability that a bomb dropped from a plane will strike the target is 0.2  
If 6 bombs are dropped,  
(i) Find the probability that at least two will strike the target.  
(ii) Find the mean and variance of the distribution 3

10. **Read the following text and answer the questions based on the same:**

A juice machine is regulated so that it discharges an average of 200 ml per cup. If amount of drink is normally distributed with a standard deviation equal to 15 ml.

- (i) What fraction of the cups will contain more than 190 ml?  
(ii) What is the probability that a cup contains between 180 and 205 ml?  
(iii) How many cups will probably overflow, if 230 ml cups are used for the next 1000 drinks?



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- Section D contains 1 Case Based Question of 4 marks.
- All questions are compulsory.

Use the following values if required:

$$P(z > -1.34) = 0.91, \quad P(X < 0.67) = 0.7486, \quad P(z < 0.33) = 0.6293, \quad P(z < 1.33) = 0.9082 \quad \text{and} \\ e^{-2.4} = 0.0907$$

#### SECTION A

- For a random variable  $X$ ,  $E(X) = 2$  and  $E(X^2) = 8$ . Then the standard deviation of  $X$  is 1  
 a) 2                      b) 8                      c) 6                      d) information not sufficient.
- If the expectation of a Poisson variable is 1, then find  $P(X < 2)$ . 1  
 a)  $e^{-1}$                       b)  $2e^{-1}$                       c)  $1 - e^{-1}$                       d)  $1 - 2e^{-1}$
- If  $X$  be a normal variate with mean 2 and variance 9, then the value of  $t$  such that 1  
 $P(2 < X < t) = 0.4772$ .  
 (a) 6                      (b) 2                      (c) 8                      (d) 11

#### ASSERTION-REASON BASED QUESTION

In question 4, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

- Both A and R are true and R is the correct explanation of A.
  - Both A and R are true but R is not the correct explanation of A.
  - A is true but R is false.
  - A is false but R is true.
- Assertion:** The probability distribution that follows Bernoulli's trail can have Mean = 4 and Standard Deviation = 3. 1  
**Reason:** Standard deviation is always less than the mean of a distribution.

## SECTION B

5. The mean of a normal distribution is 40 and 9% of the values are greater than 50. Find the standard deviation of the distribution. 2
6. For the probability distribution given below, 2
- |      |   |    |    |   |
|------|---|----|----|---|
| X    | 0 | 1  | 2  | 3 |
| P(X) | k | 2k | 4k | k |
- find the value of
- i) k ii) Find E(X)
7. The incidence of occupational disease in an industry is such that the workers have 80 percent chance of not getting the disease. What is the probability that out of six workers 4 or more will come in contact of the disease? 2

## SECTION C

8. The station master of lucknow Junction knows from his past experience that only 96% of the trains arrive in or on time at lucknow Junction. On any day 60 trains arrive at the junction and the station master claims that not more than 5% of the trains arrive late at lucknow Junction. If the random variable associated with number of trains arriving late approximates with Poisson's distribution, Check if station masters claim is justified? 3
9. In a discrete probability distribution the probability that a bomb dropped from a plane will strike the target is 0.2  
If 5 bombs are dropped,  
(i) Find the probability that at least two will strike the target.  
(ii) Find the mean and variance of the distribution. 3
10. **Read the following text and answer the questions based on the same:**
- A juice machine is regulated so that it discharges an average of 100 ml per cup. If amount of drink is normally distributed with a standard deviation equal to 15 ml.
- (i) What fraction of the cups will contain more than 90 ml? 1
- (ii) What is the probability that a cup contains between 80 and 105 ml? 1
- (iii) How many cups will probably overflow, if 130 ml cups are used for the next 1000 drinks? 2



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- Section C contains 2 questions of 3 marks each.
- Section D contains 1 Case Based Question of 4 marks.
- All questions are compulsory.

Use the following values if required:

$$P(z > -1.34) = 0.91, \quad P(X < 0.50) = 0.6915, \quad P(z < 1.5) = 0.9332 \text{ and } e^{-2} = 0.135$$

#### SECTION A

1. If the expectation of a Poisson variable is 1, then find  $P(X > 0)$ , where  $X$  is a Poisson variate. 1  
 a)  $e^{-1}$       b)  $2e^{-1}$       c)  $1 - e^{-1}$       d)  $1 - 2e^{-1}$
2. For a random variable  $X$ ,  $E(X) = 1$  and  $E(X^2) = 10$ . Then the standard deviation of  $X$  is 1  
 a) 9      b) 8      c) 3      d) information not sufficient.
3. If  $X$  be a normal variate with mean 5 and variance 9, then the value of  $t$  such that 1  
 $P(5 < X < t) = 0.4772$ .  
 (a) 6      (b) 2      (c) 8      (d) 11

#### ASSERTION-REASON BASED QUESTION

In **question 4**, a statement of assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

- (a) Both A and R are true and R is the correct explanation of A.
  - (b) Both A and R are true but R is not the correct explanation of A.
  - (c) A is true but R is false.
  - (d) A is false but R is true.
4. **Assertion:** The probability distribution can have Mean = 5 and Standard Deviation = 2. 1  
**Reason:** Standard deviation is always less than the mean of a distribution.

## SECTION B

5. The mean of a normal distribution is 100 and 9% of the values are greater than 120. Find the standard deviation of the distribution. 2
6. The incidence of occupational disease in an industry is such that the workers have 10 percent chance of suffering from it. What is the probability that out of five workers 3 or more will come in contact of the disease? 2
7. For the probability distribution given below, 2

X	0	1	2	3
P(X)	k	2k	3k	2k

find the value of

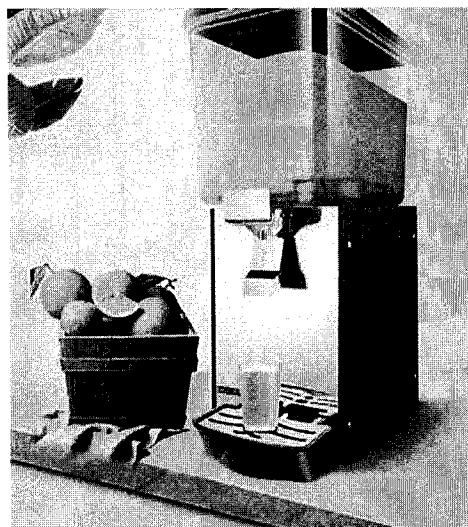
- i) k                      ii) Find E(X)

## SECTION C

8. The station master of Aurangabad Junction knows from his past experience that only 4% of the trains arrive late at Aurangabad Junction. On any day 50 trains arrive at the junction and the station master claims that not more than 6% of the trains arrive late at Aurangabad Junction. If the random variable associated with number of trains arriving late approximates with Poison's distribution, Check if station masters claim is justified?
9. In a discrete probability distribution the probability that a bomb dropped from a plane will strike the target is 0.4  
If 5 bombs are dropped,  
(i) Find the probability that at least two will strike the target.  
(ii) Find the mean and variance of the distribution
10. **Read the following text and answer the questions based on the same:**

A juice machine is regulated so that it discharges an average of 300 ml per cup. If amount of drink is normally distributed with a standard deviation equal to 20 ml.

- What fraction of the cups will contain more than 290 ml?
- What is the probability that a cup contains between 290 and 330ml?
- How many cups will probably overflow, if 340 ml cups are used for the next 1000 drinks?



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